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Yokomori et al.

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[54] DEVELOPING CARTRIDGE

[75] Inventors: **Kanji Yokomori**, Odawara; **Hisayoshi Kojima**, Mishima; **Kazuhiko Kanno**, Numazu, all of Japan

[73] Assignee: **Canon Kabushiki Kaisha**, Tokyo, Japan

[*] Notice: This patent issued on a continued prosecution application filed under 37 CFR 1.53(d), and is subject to the twenty year patent term provisions of 35 U.S.C. 154(a)(2).

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[22] Filed: **Mar. 3, 1997**

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[51] Int. Cl.⁷ **G03G 21/16**

[52] U.S. Cl. **399/119; 399/262; 399/223; 399/227**

[58] Field of Search 399/119, 120, 399/262, 263, 223, 226, 227

[56] References Cited

U.S. PATENT DOCUMENTS

4,583,832	4/1986	Kasamura et al.	355/3 DD
4,622,916	11/1986	Tanaka et al.	
4,866,482	9/1989	Hirasawa et al.	355/260
4,916,490	4/1990	Tanaka et al.	355/245
4,922,301	5/1990	Katoh et al.	
5,198,866	3/1993	Kimura et al.	355/326
5,235,383	8/1993	Tada et al.	355/200
5,442,421	8/1995	Kojima	355/211
5,471,284	11/1995	Fujii et al.	355/210
5,497,220	3/1996	Inomata et al.	355/245
5,521,693	5/1996	Kojima et al.	355/326 R

5,565,973	10/1996	Fujishiro et al.	
5,585,598	12/1996	Kasahara et al.	
5,587,783	12/1996	Nakamura et al.	
5,666,613	9/1997	Kumon et al.	399/227
5,671,465	9/1997	Kimura et al.	399/119
5,671,470	9/1997	Maruta et al.	399/235

FOREIGN PATENT DOCUMENTS

0613060	8/1994	European Pat. Off.	
0644465	3/1995	European Pat. Off.	
58-134663	8/1983	Japan	
60-26377	2/1985	Japan	
2185914	8/1987	United Kingdom	

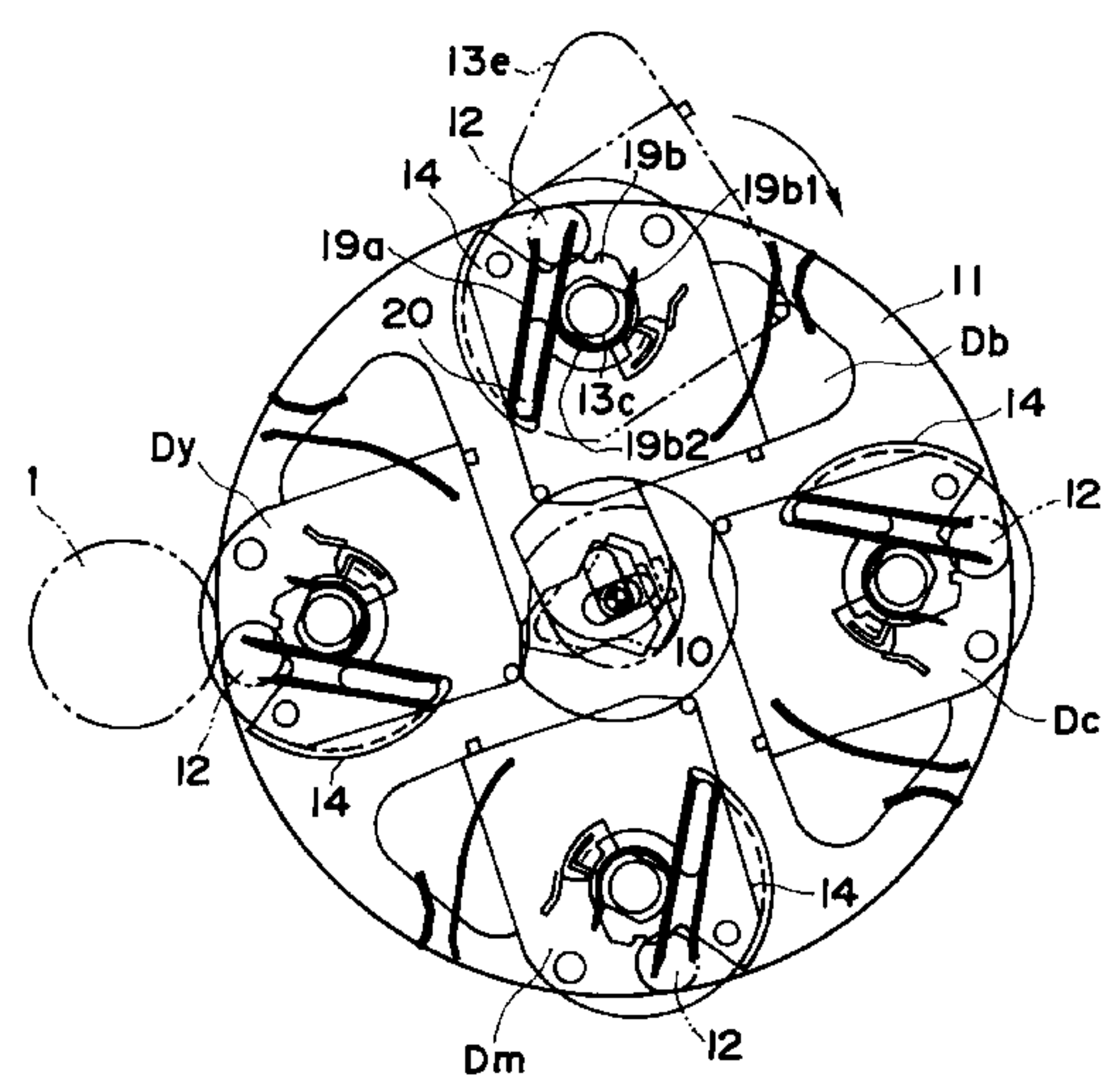
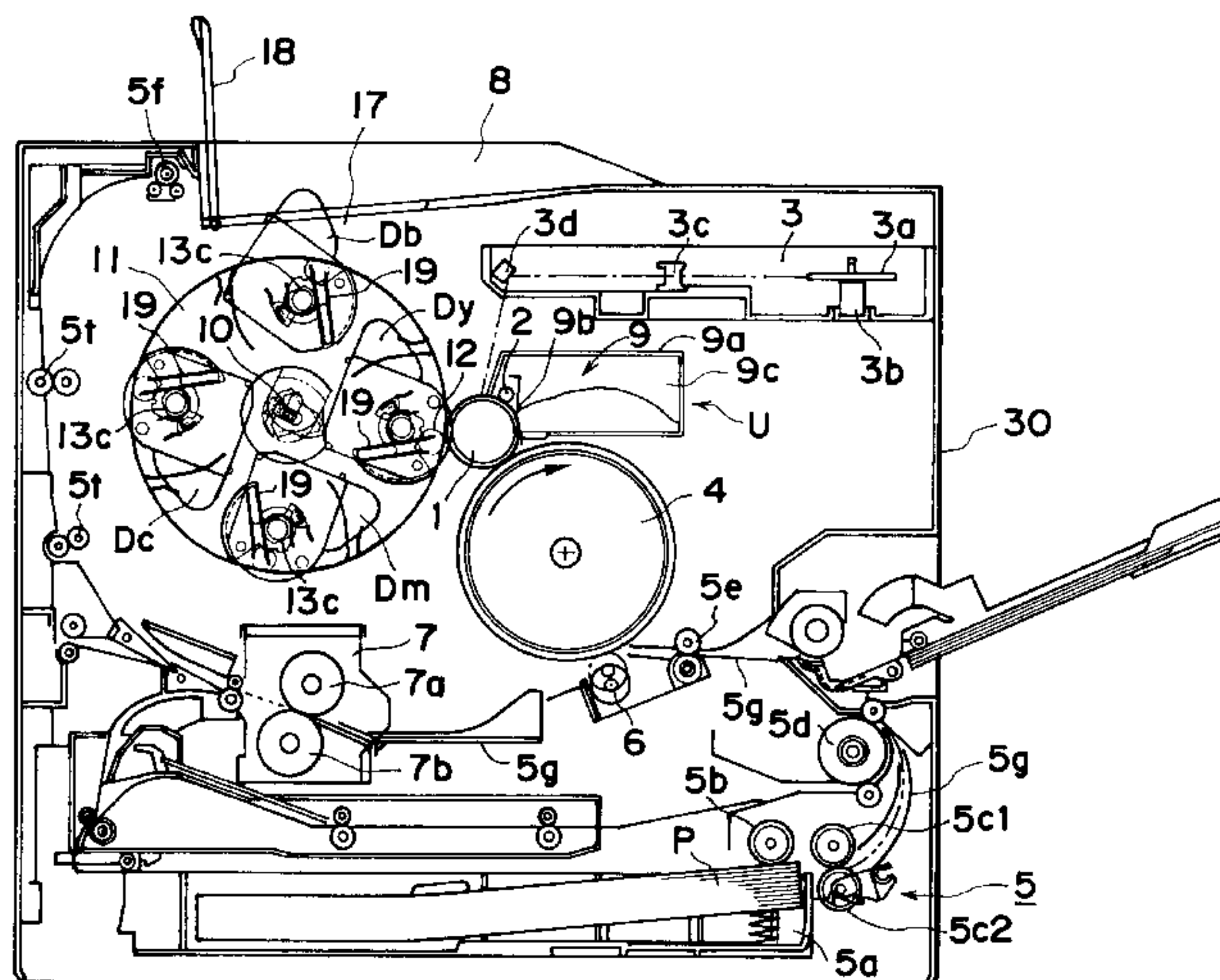
Primary Examiner—Richard Moses

Attorney, Agent, or Firm—Fitzpatrick, Cella, Harper & Scinto

[57] ABSTRACT

A developing cartridge for developing a latent image formed on the photosensitive member, wherein the developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, the developing cartridge includes a cartridge frame; developing means for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus; a first projected portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means; a second projected portion outwardly projected from the cartridge frame portion adjacent the other longitudinal end of the developing means; a first urging force receptor portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means; a second urging force receptor portion outwardly projected from the cartridge frame portion adjacent the other longitudinal end of the developing means; a first contact portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means; a second contact portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means.

62 Claims, 26 Drawing Sheets



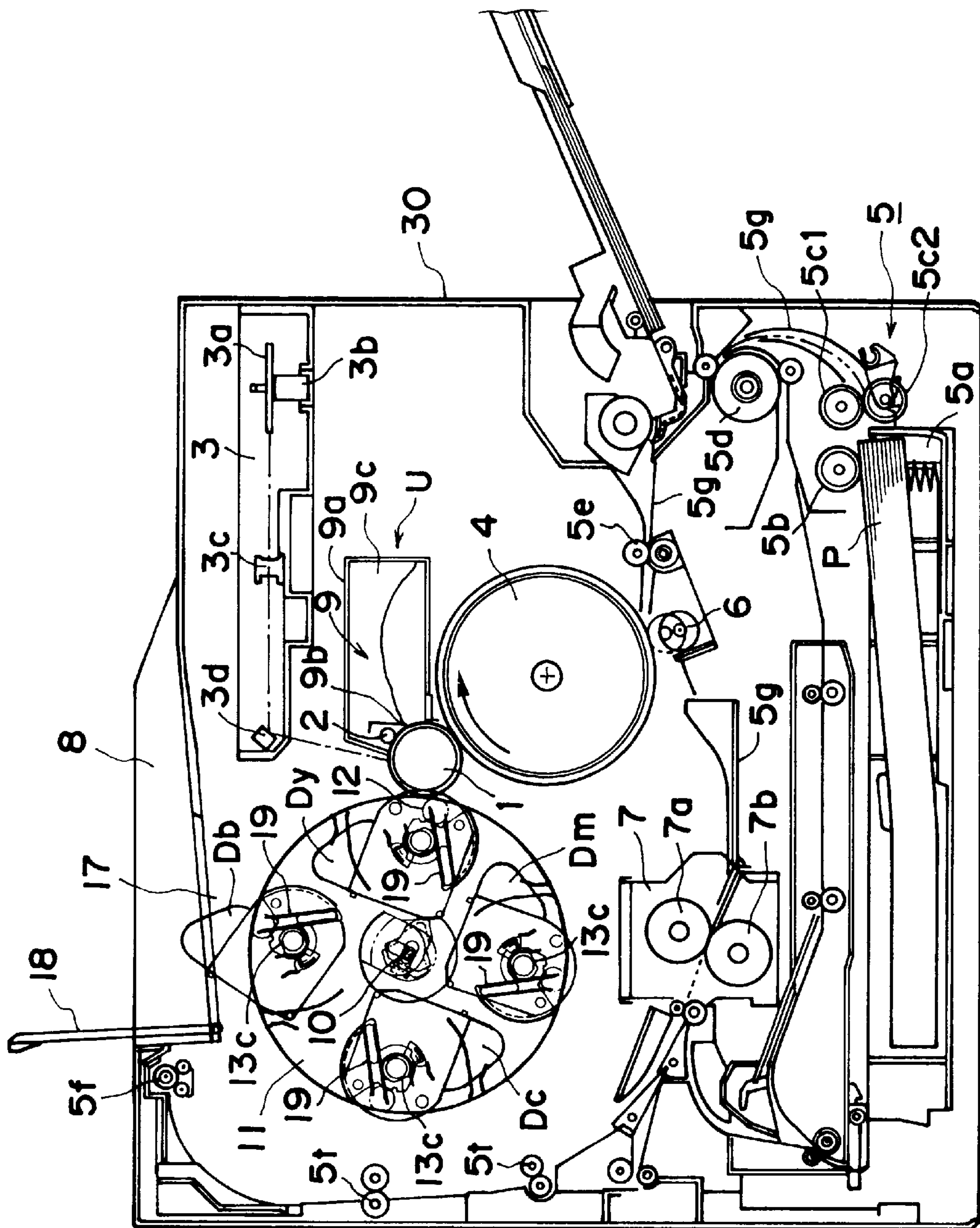


Fig. 1

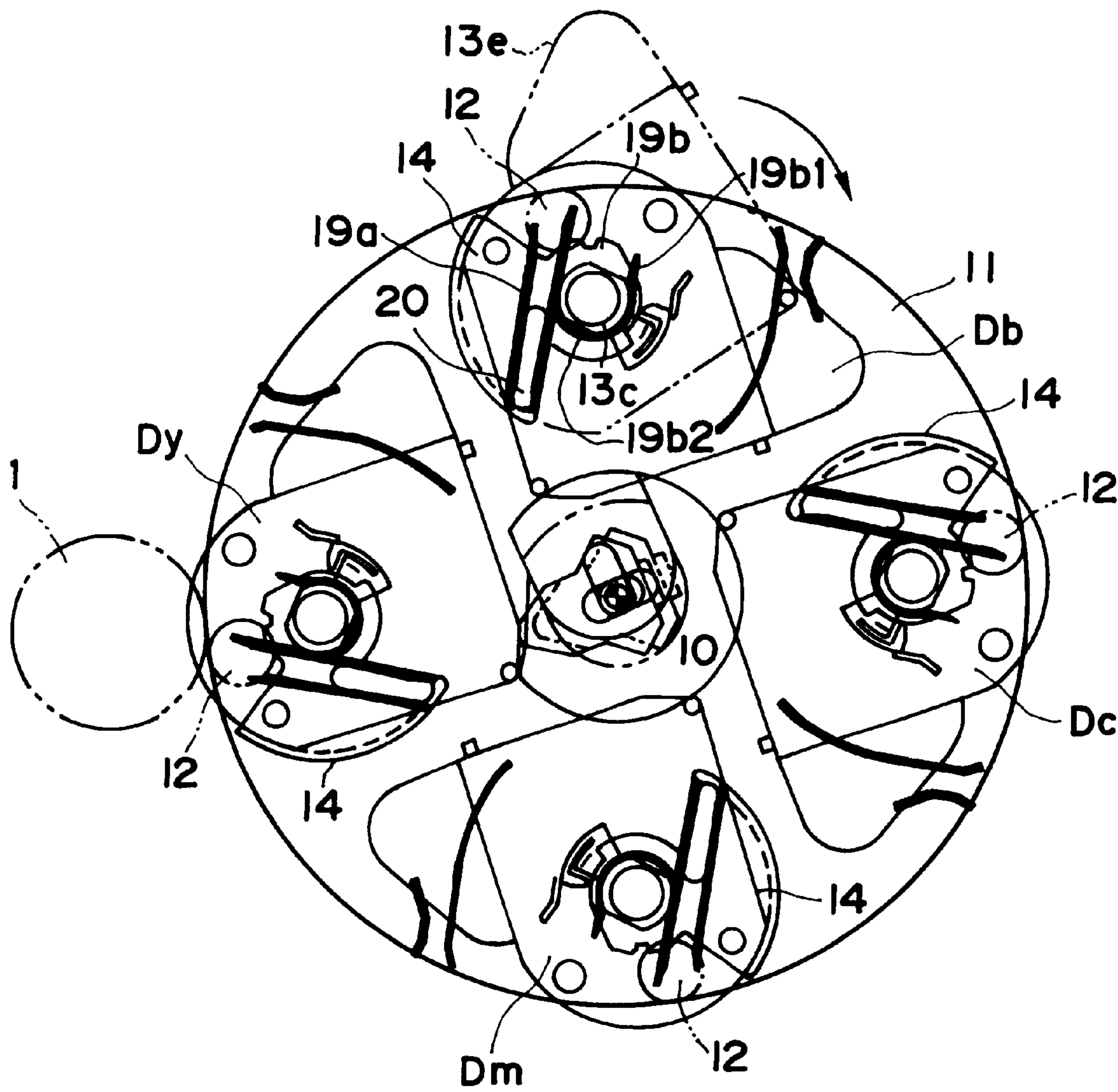


FIG. 2

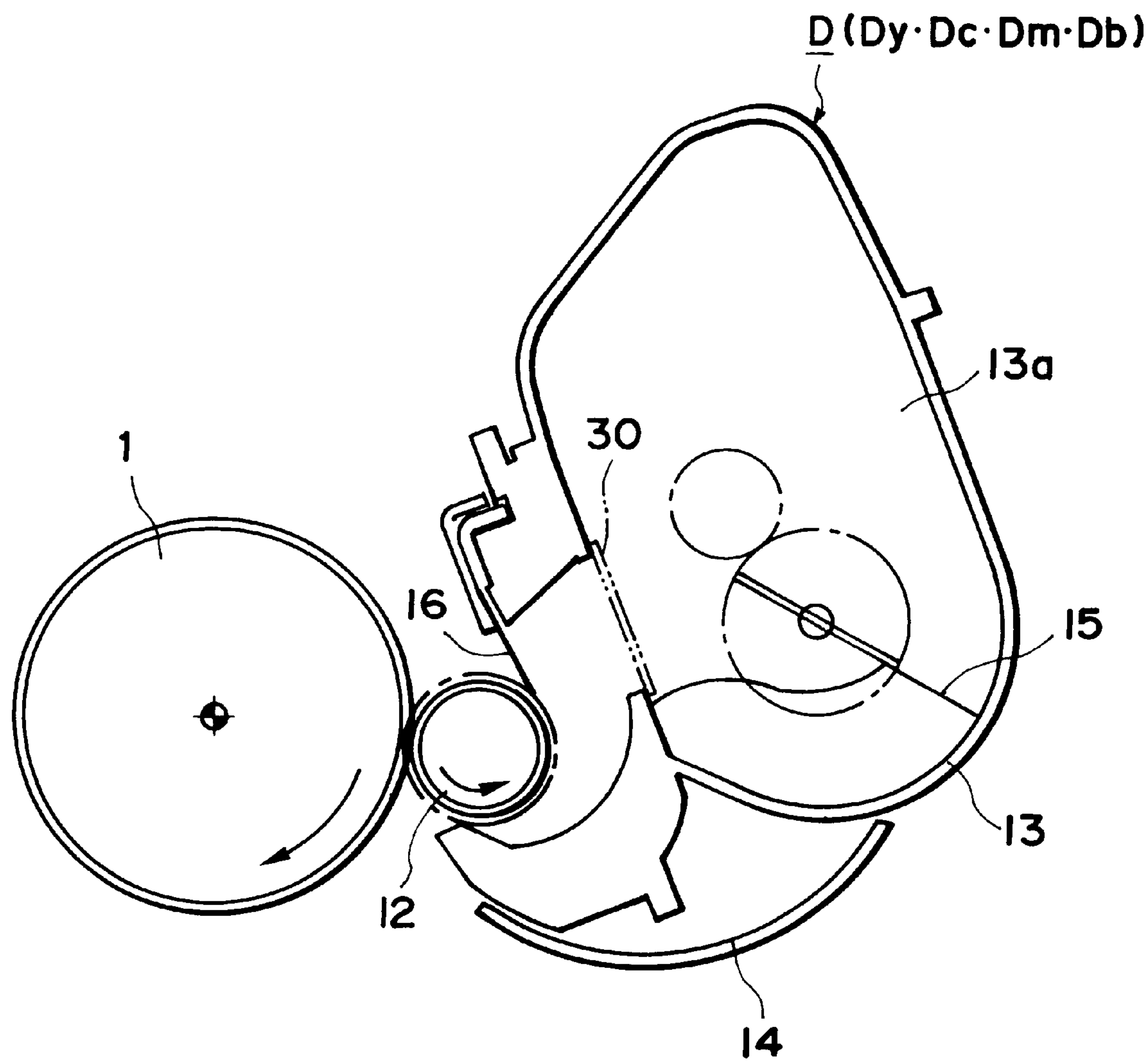


FIG. 3

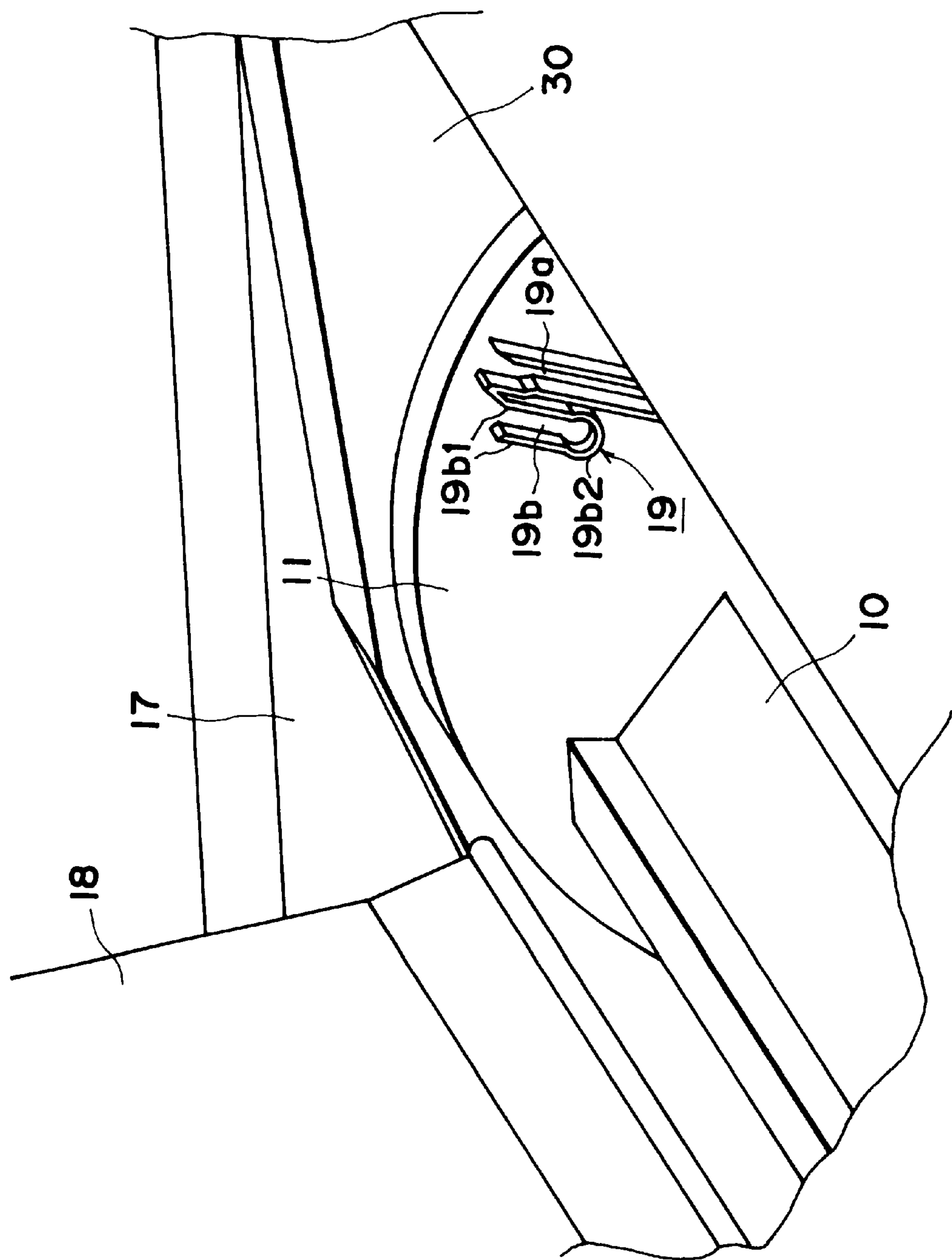


FIG. 4

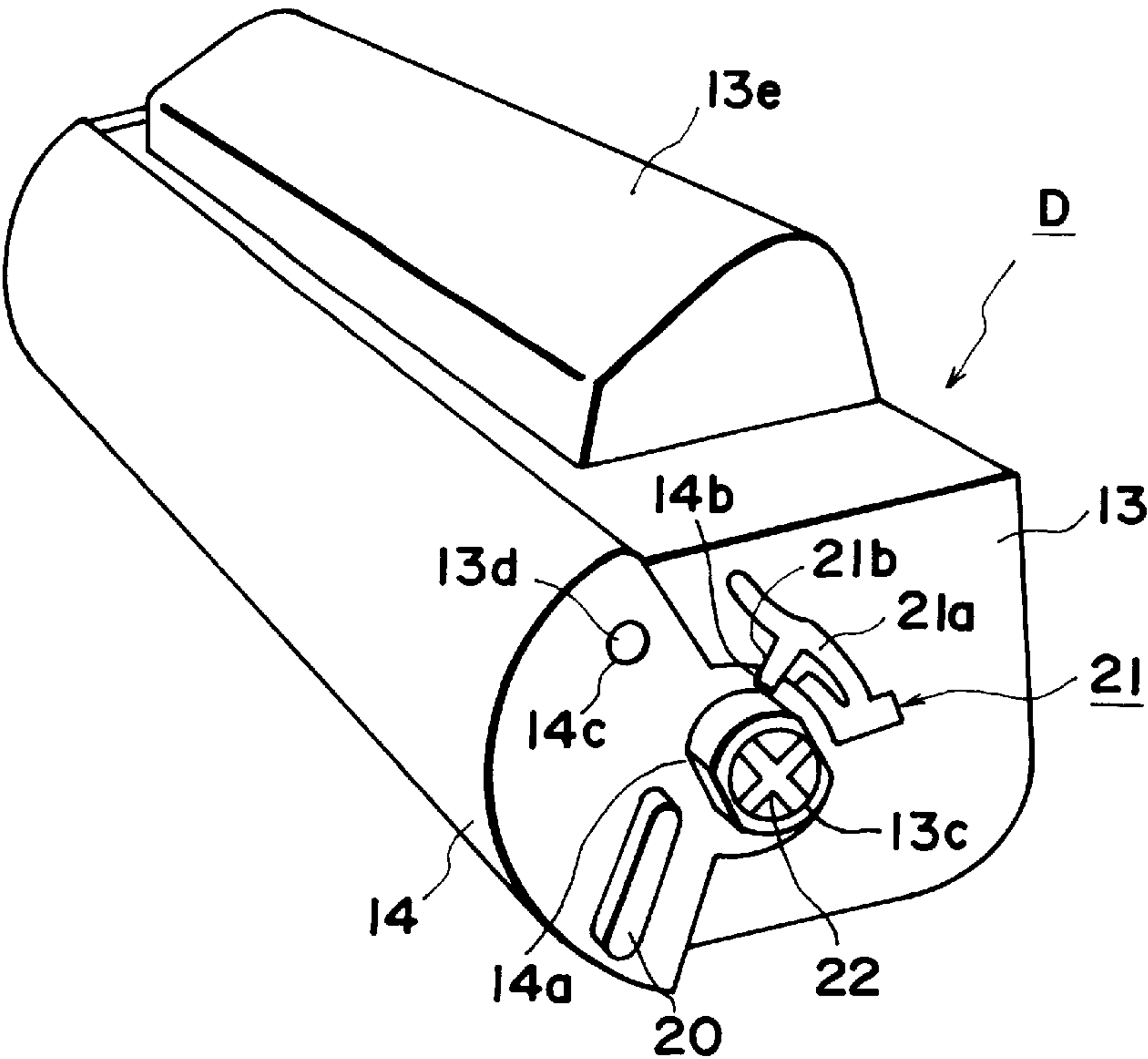


FIG. 5

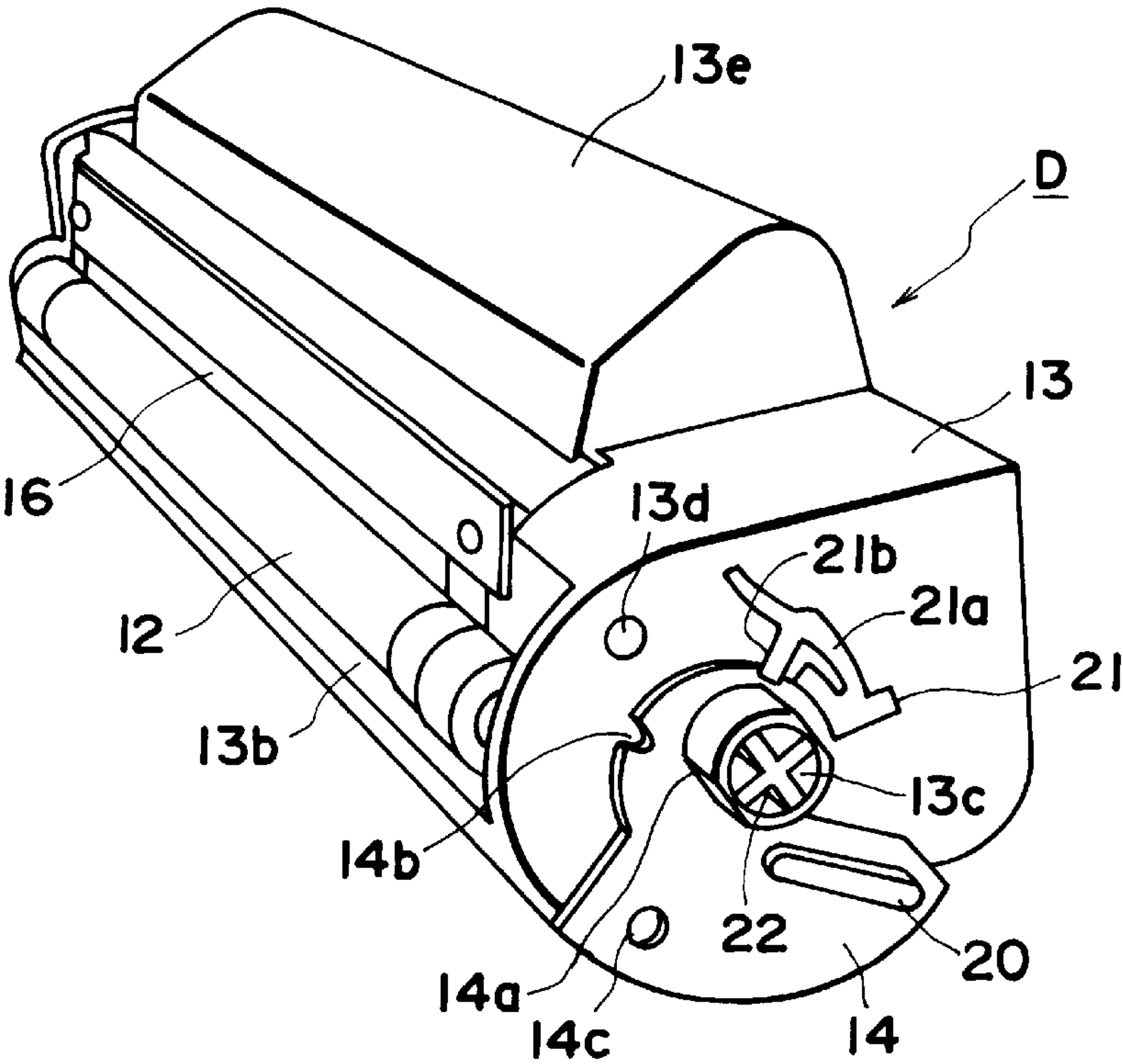


FIG. 6

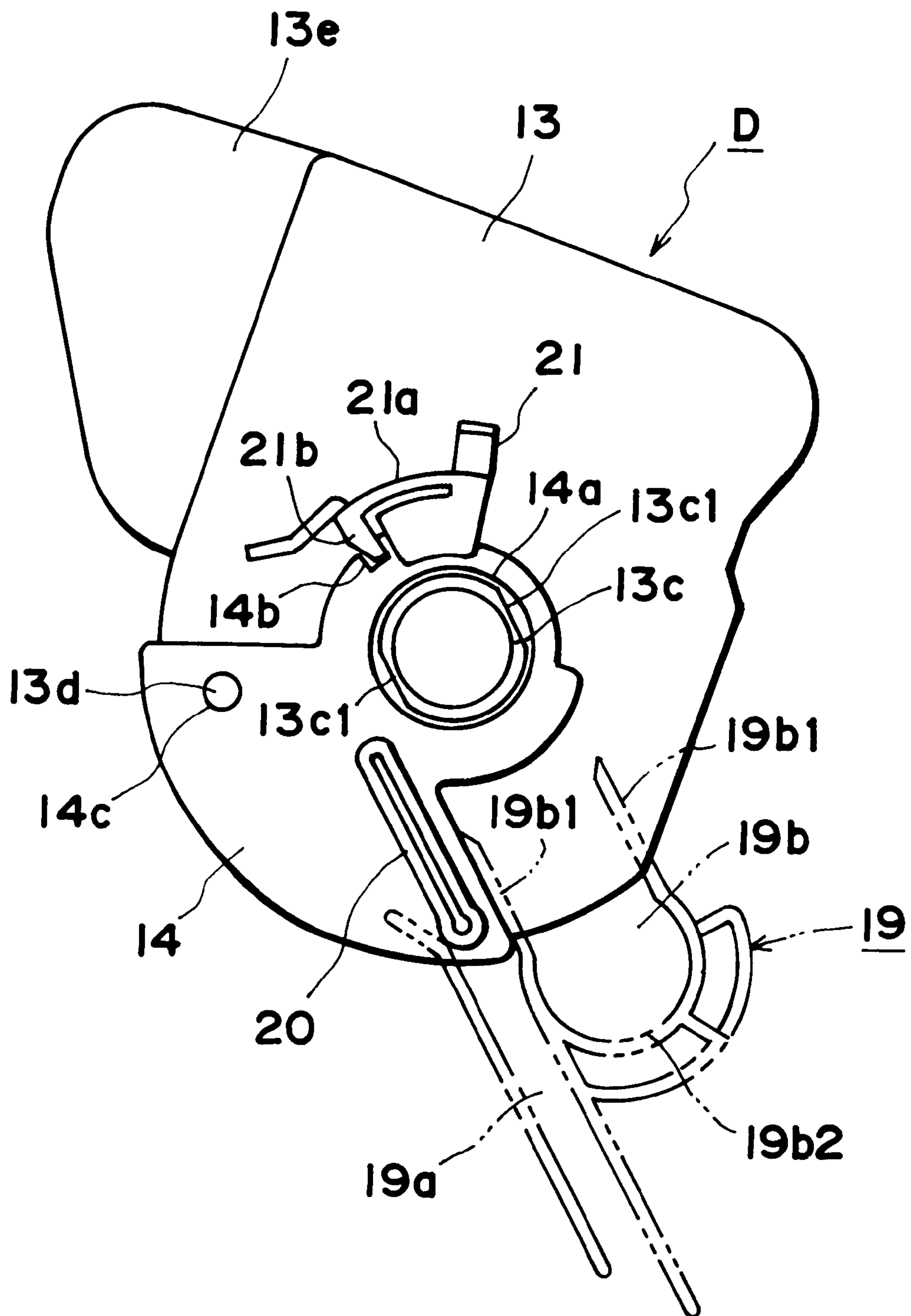


FIG. 7

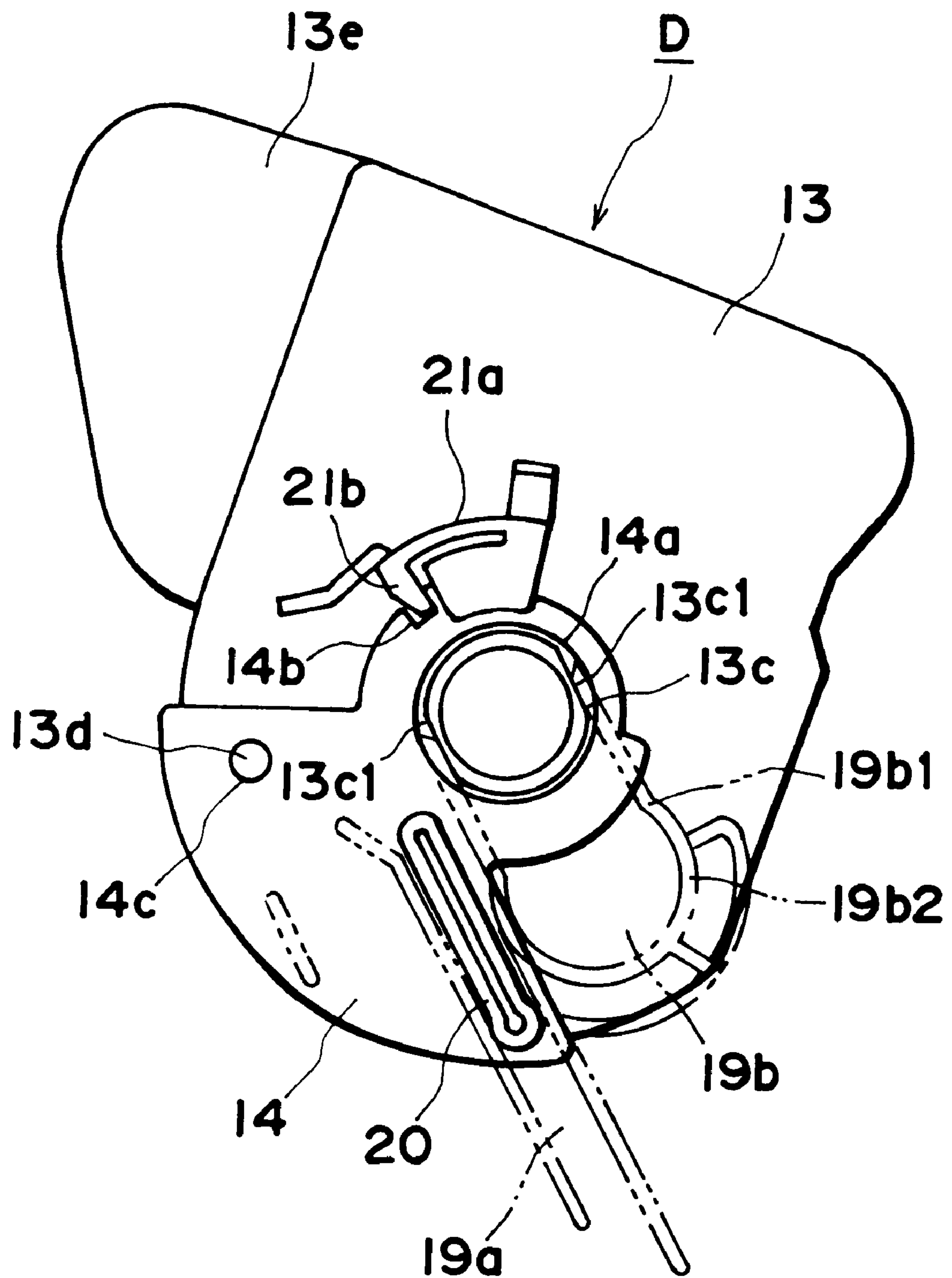


FIG. 8

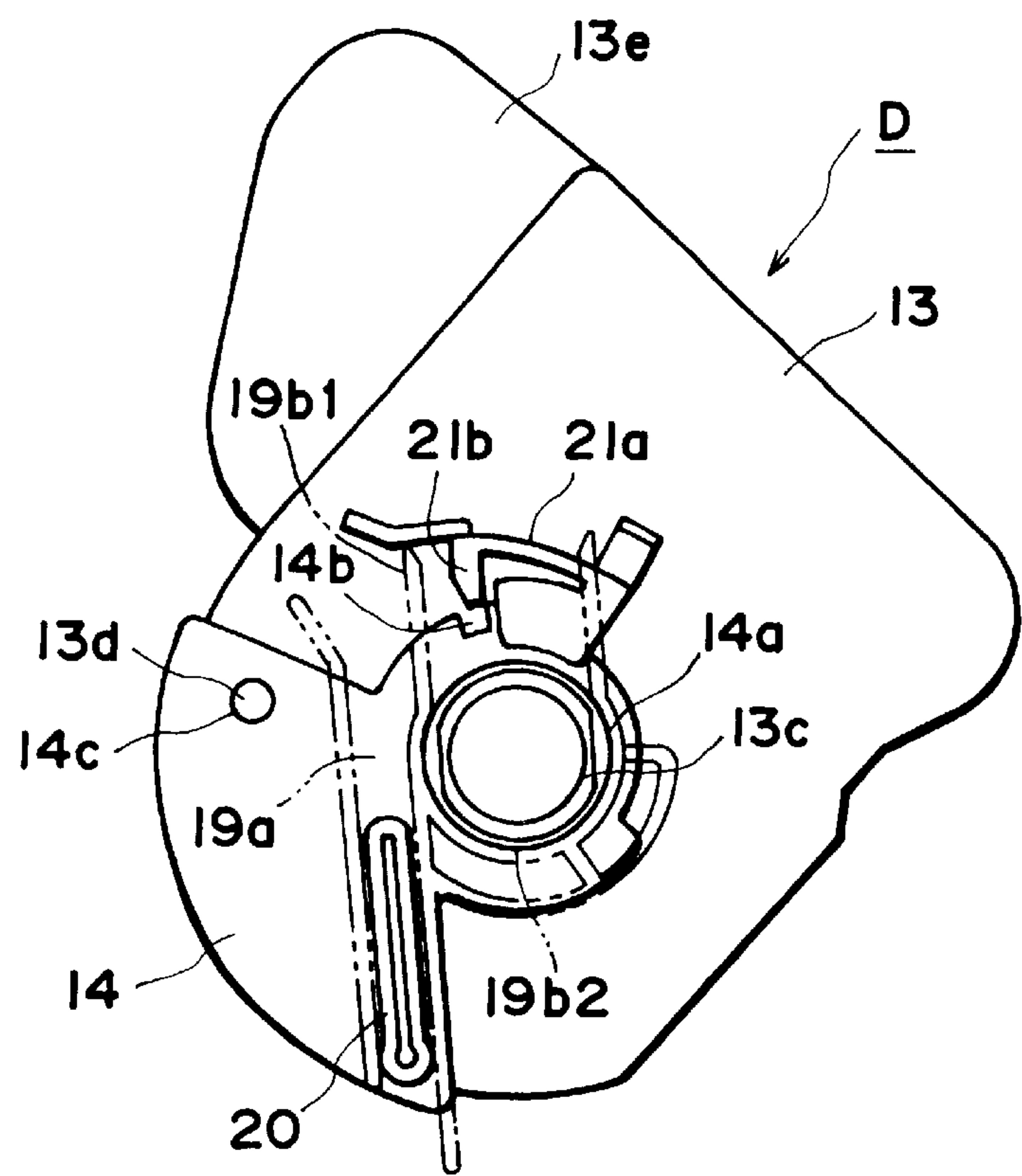


FIG. 9

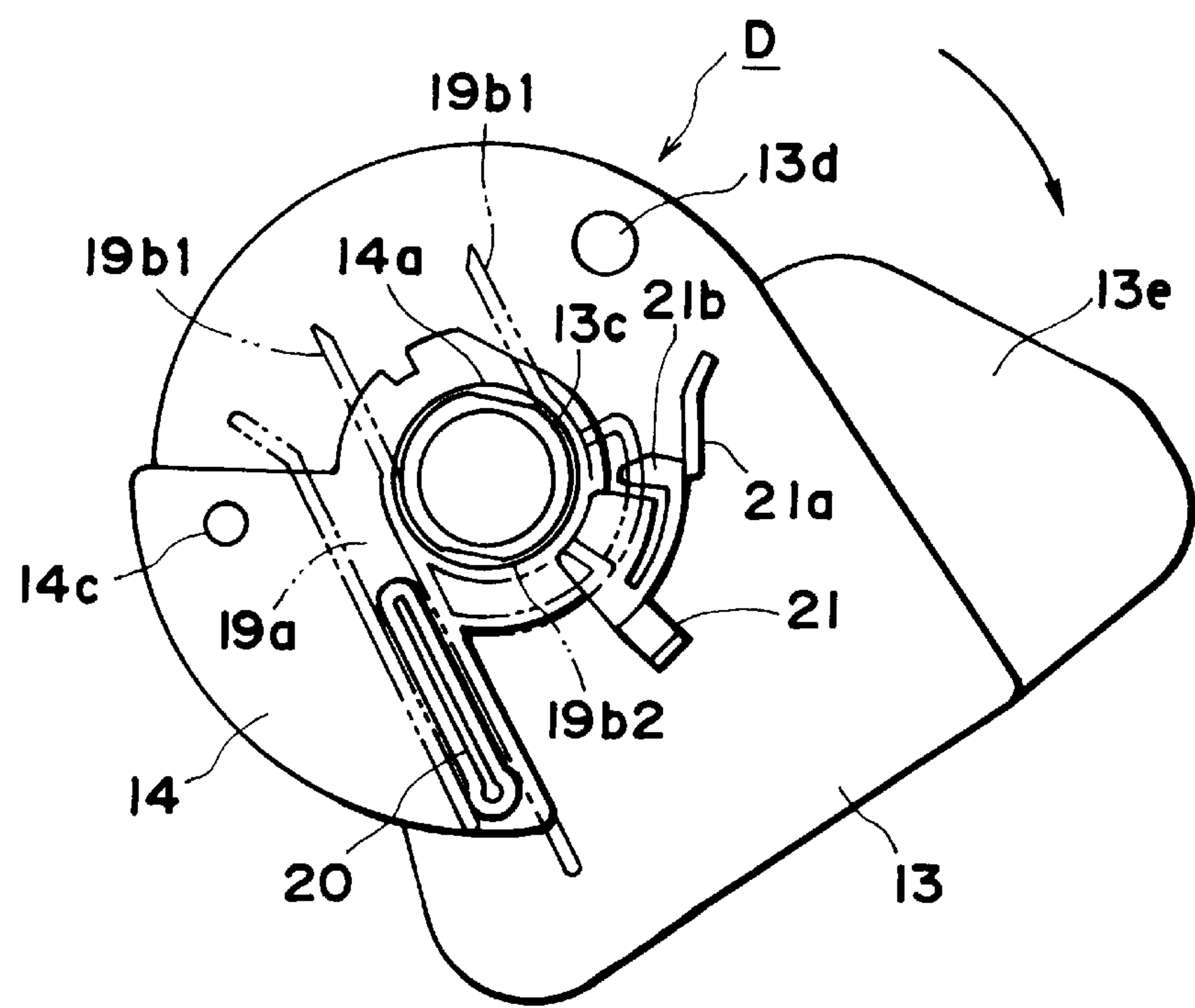


FIG. 10

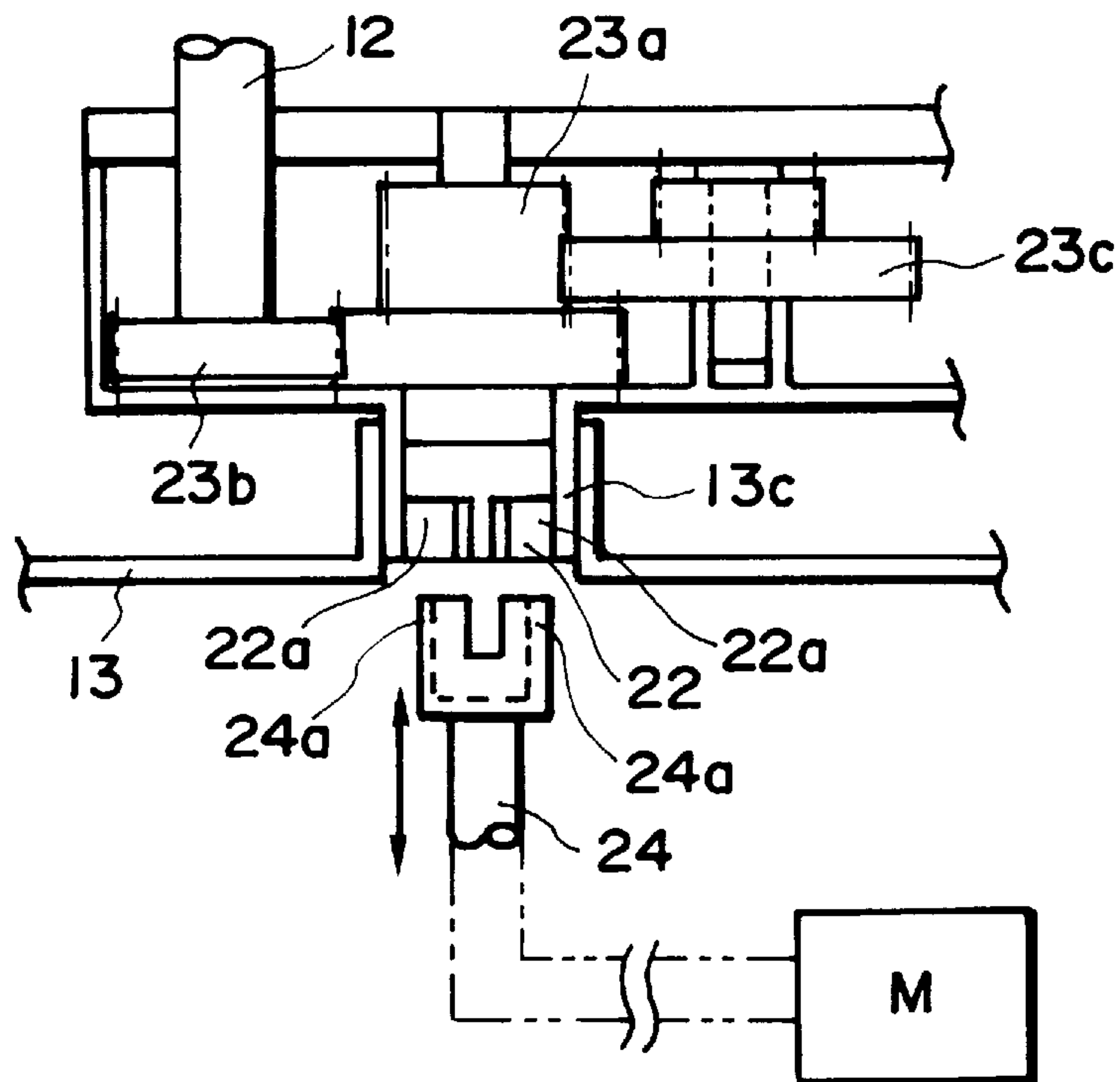


FIG. 11

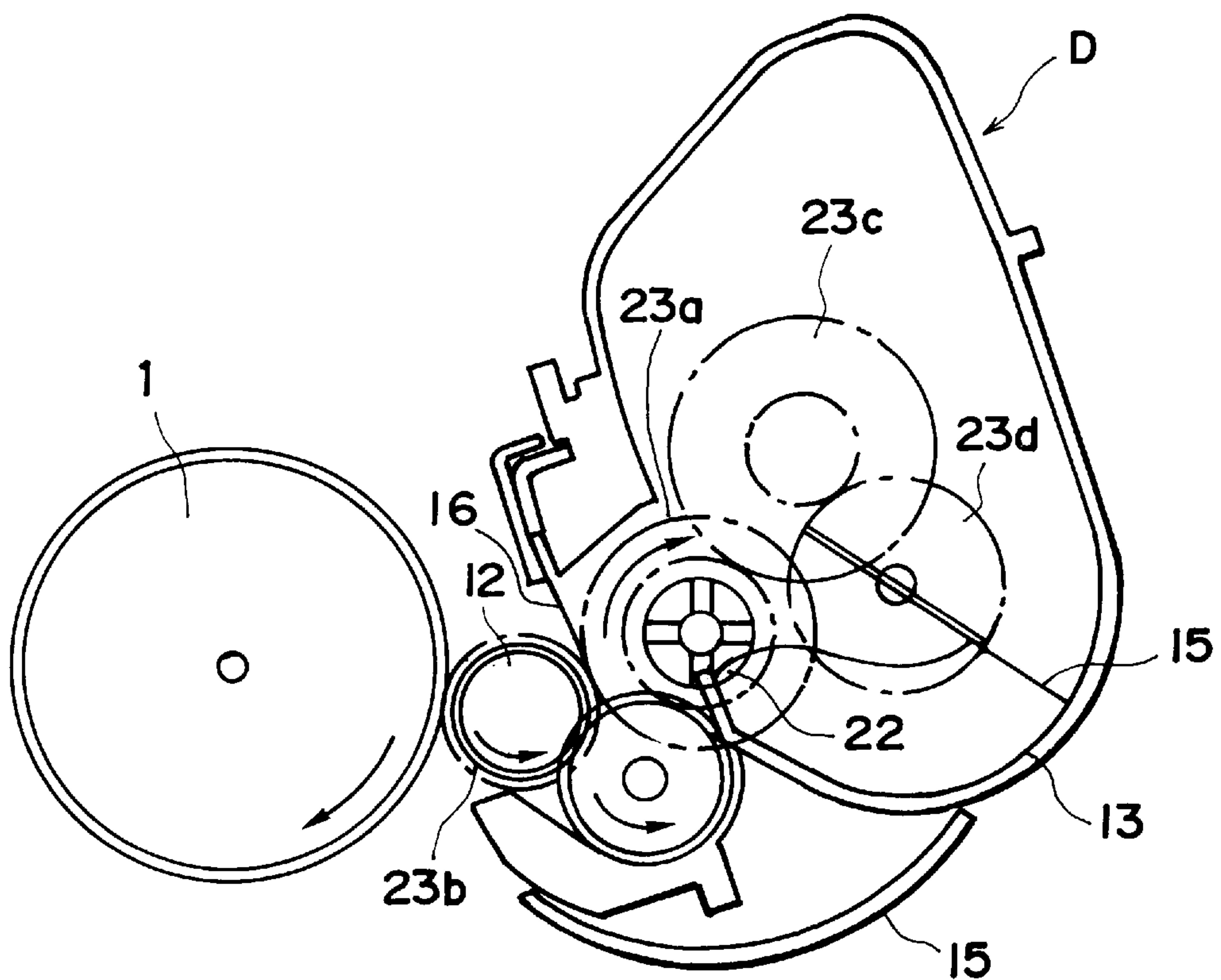


FIG. 12

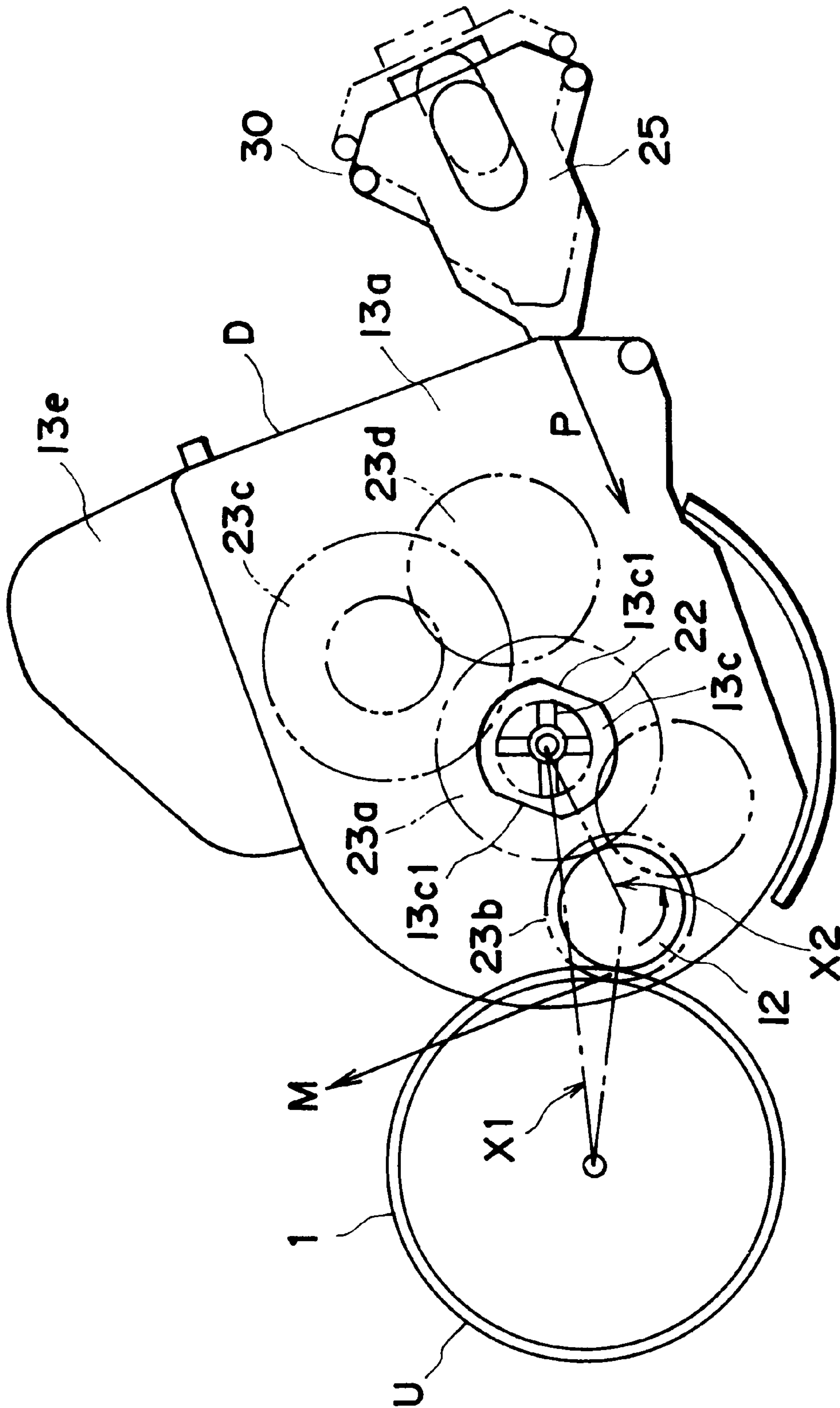
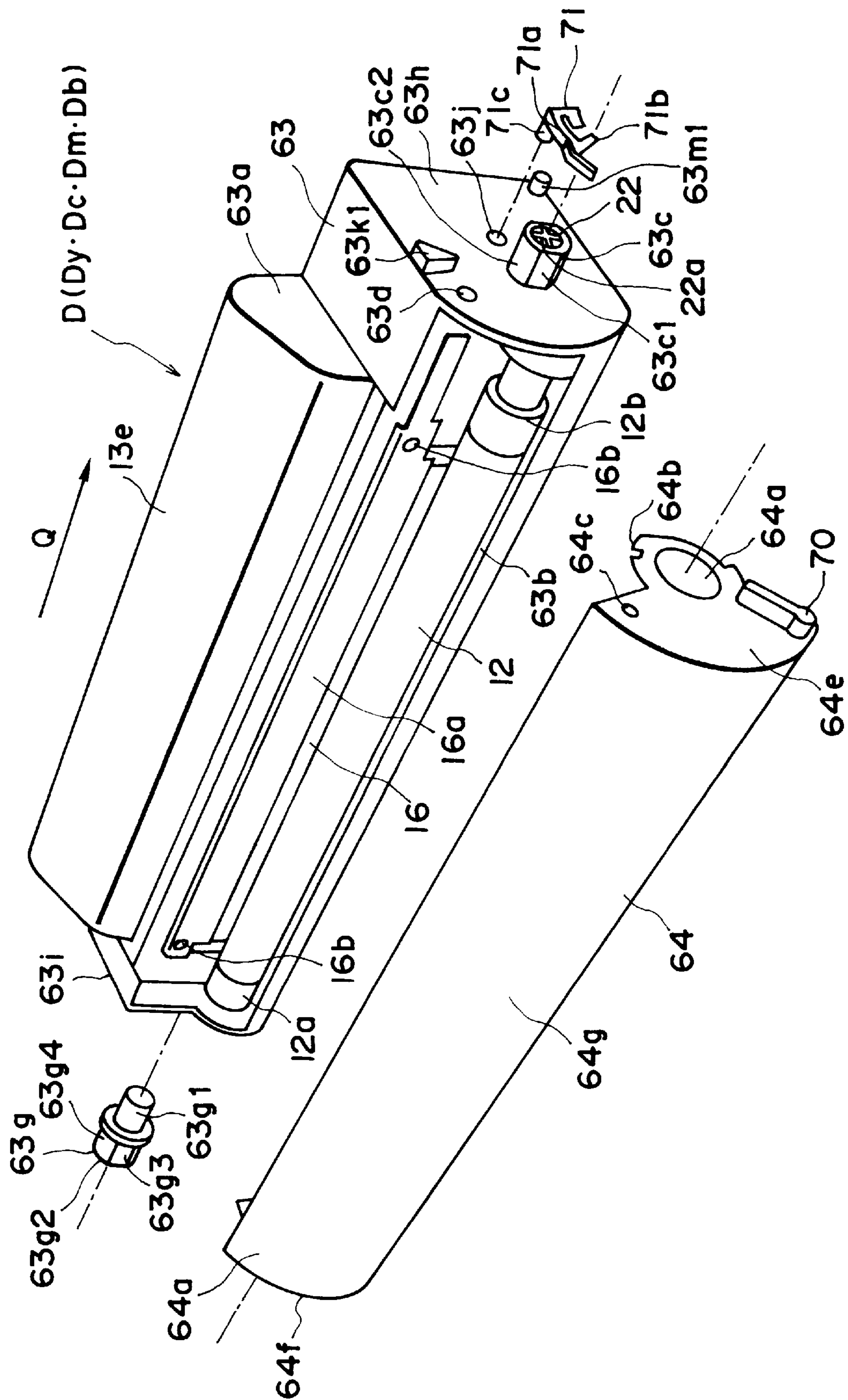


FIG. 14



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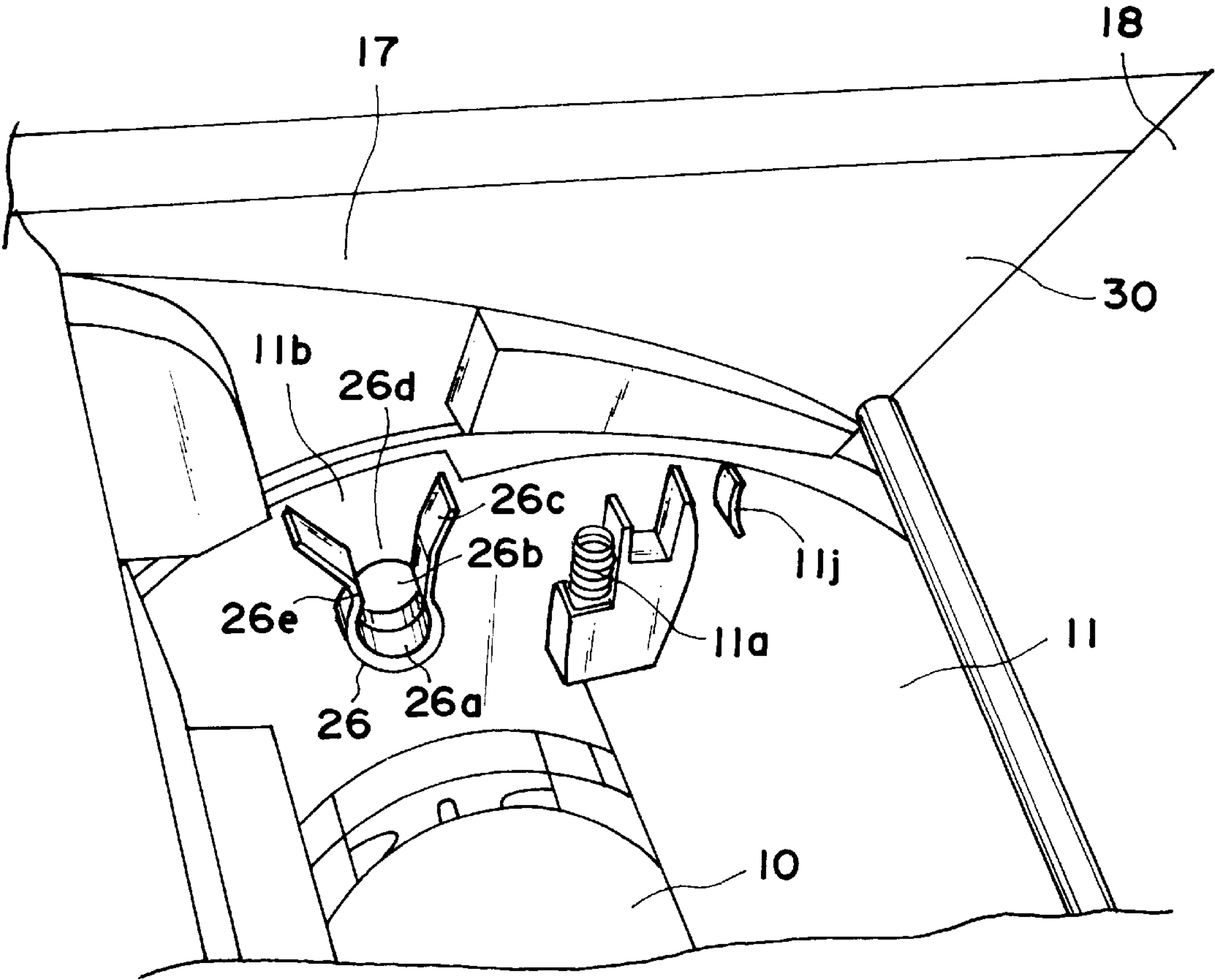


FIG. 16

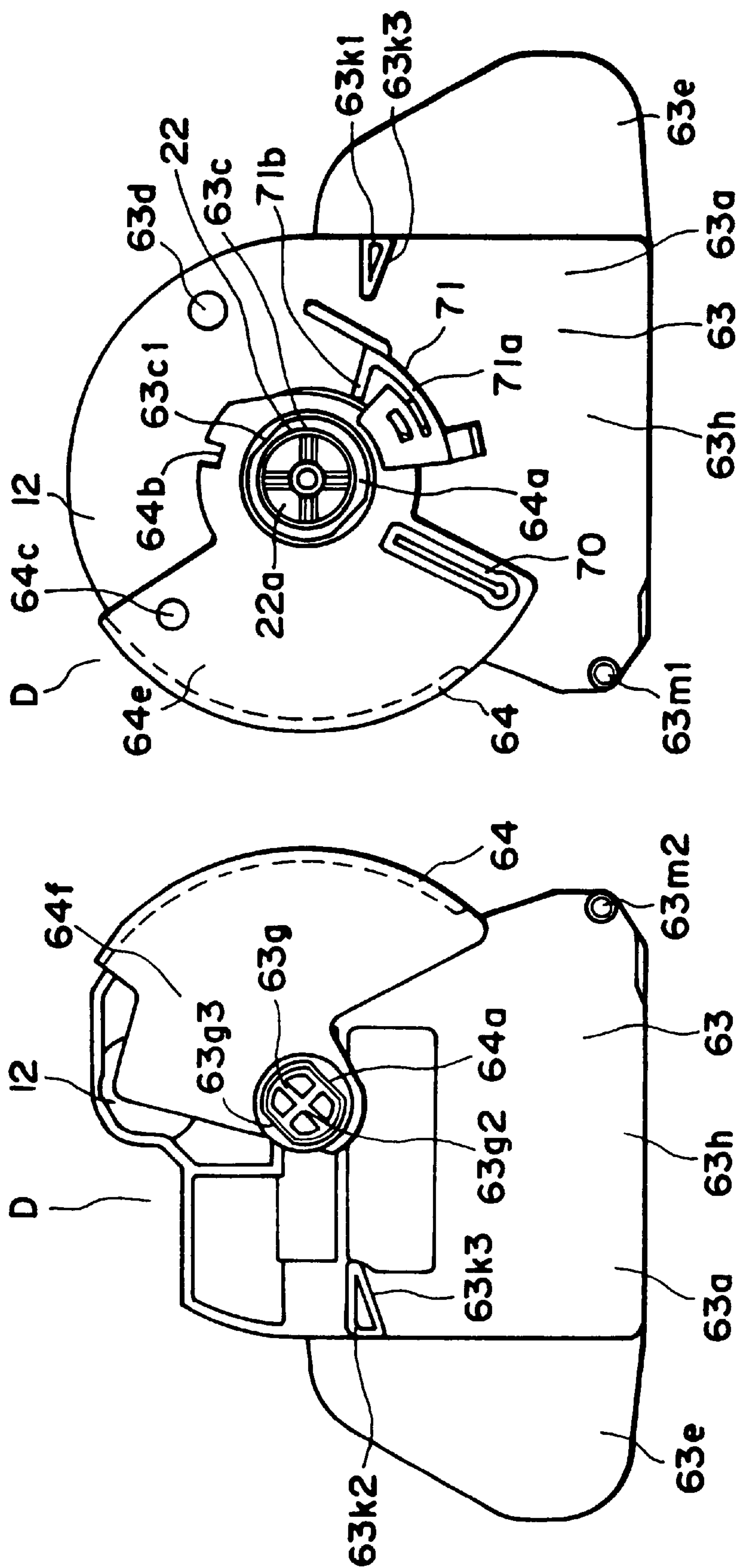


FIG. 18(a)

FIG. 18(b)

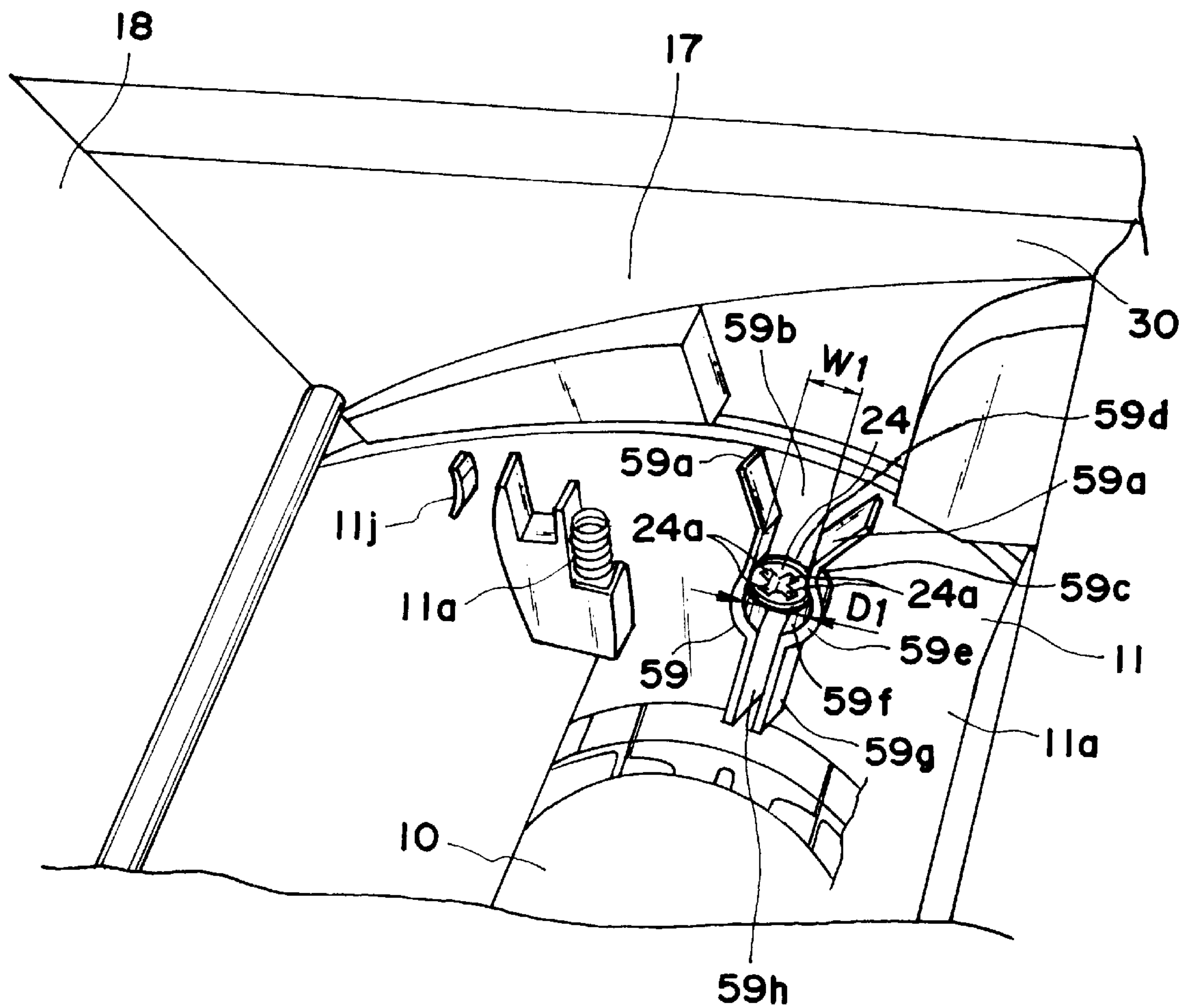


FIG. 19

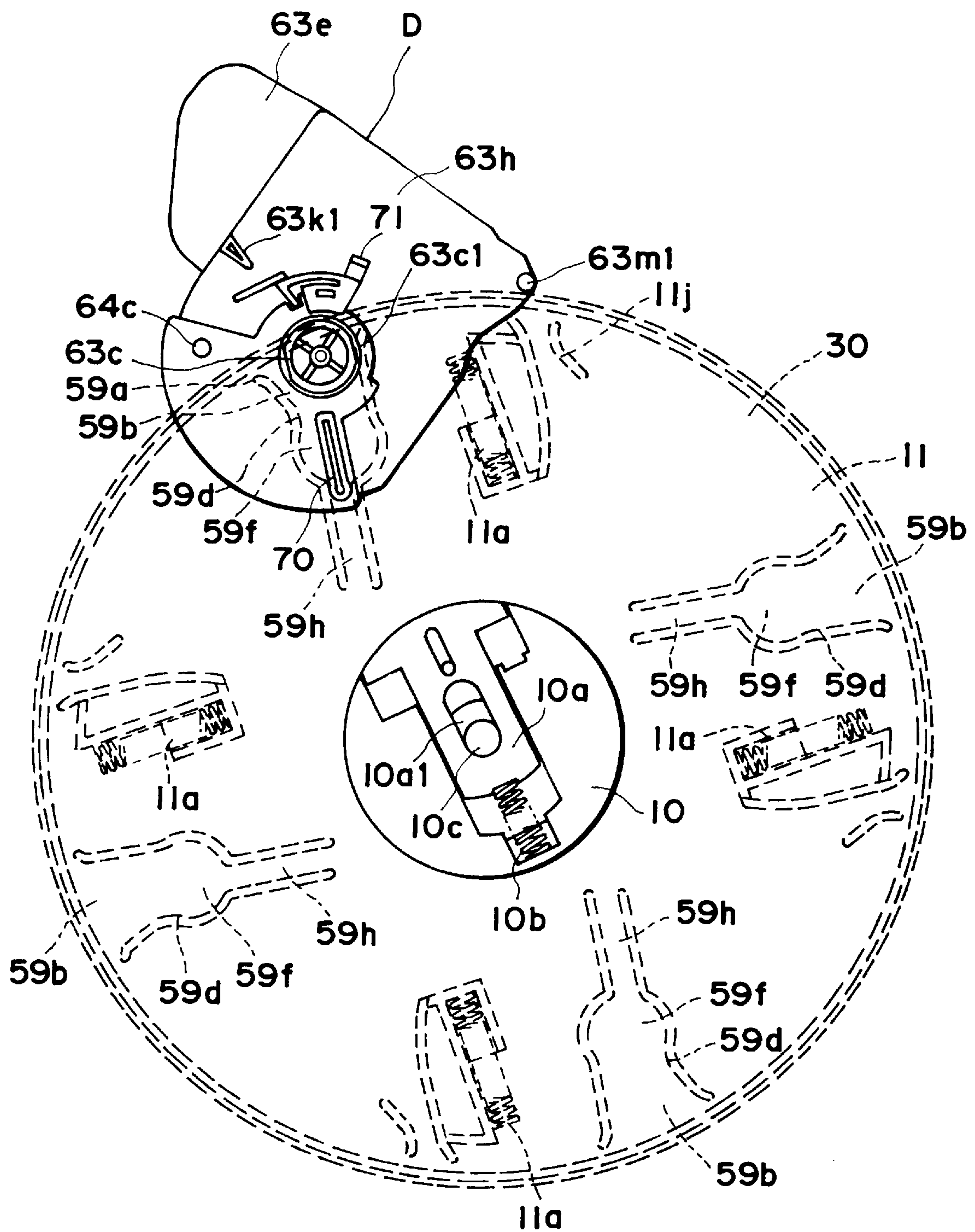


FIG. 20

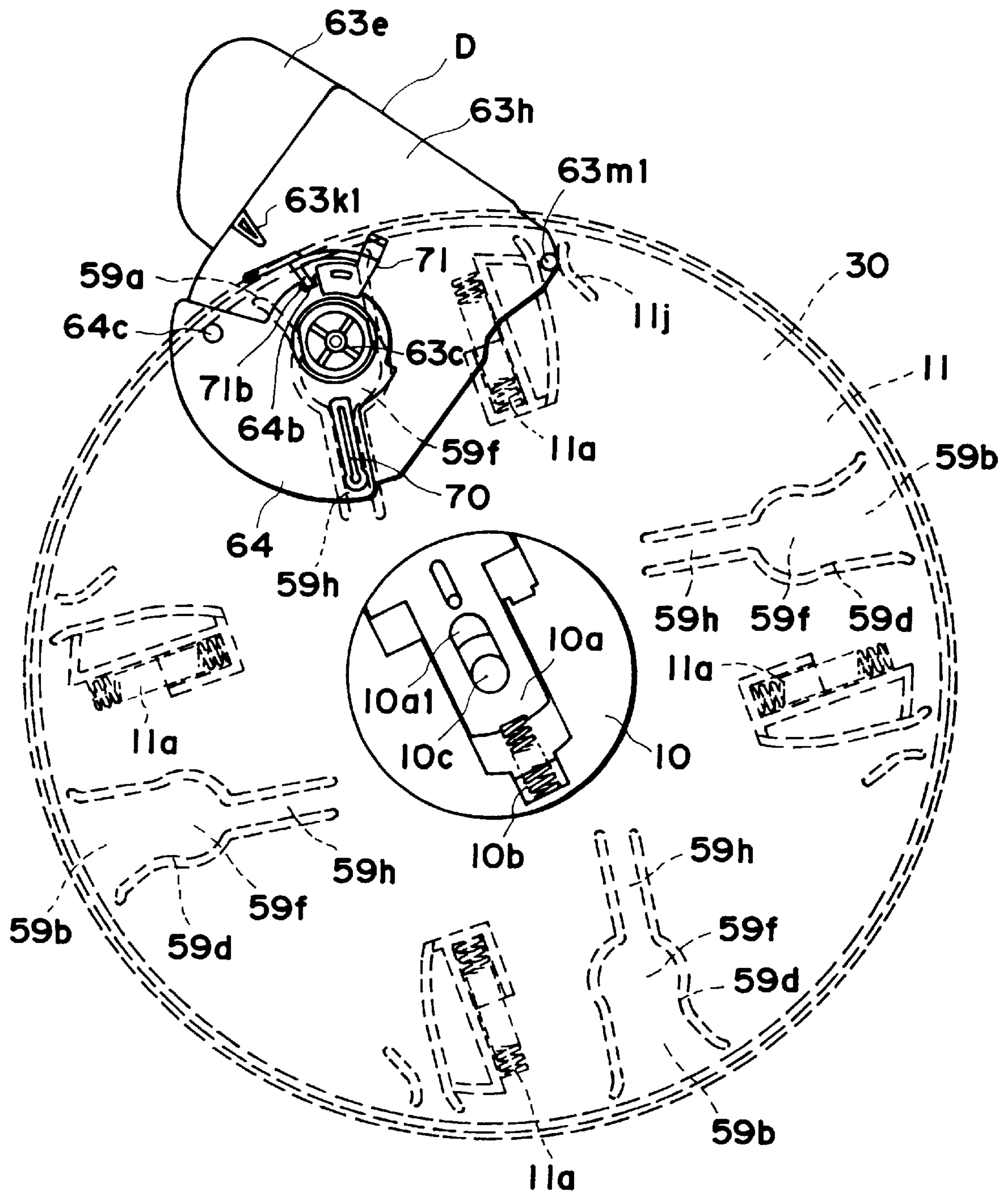


FIG. 21

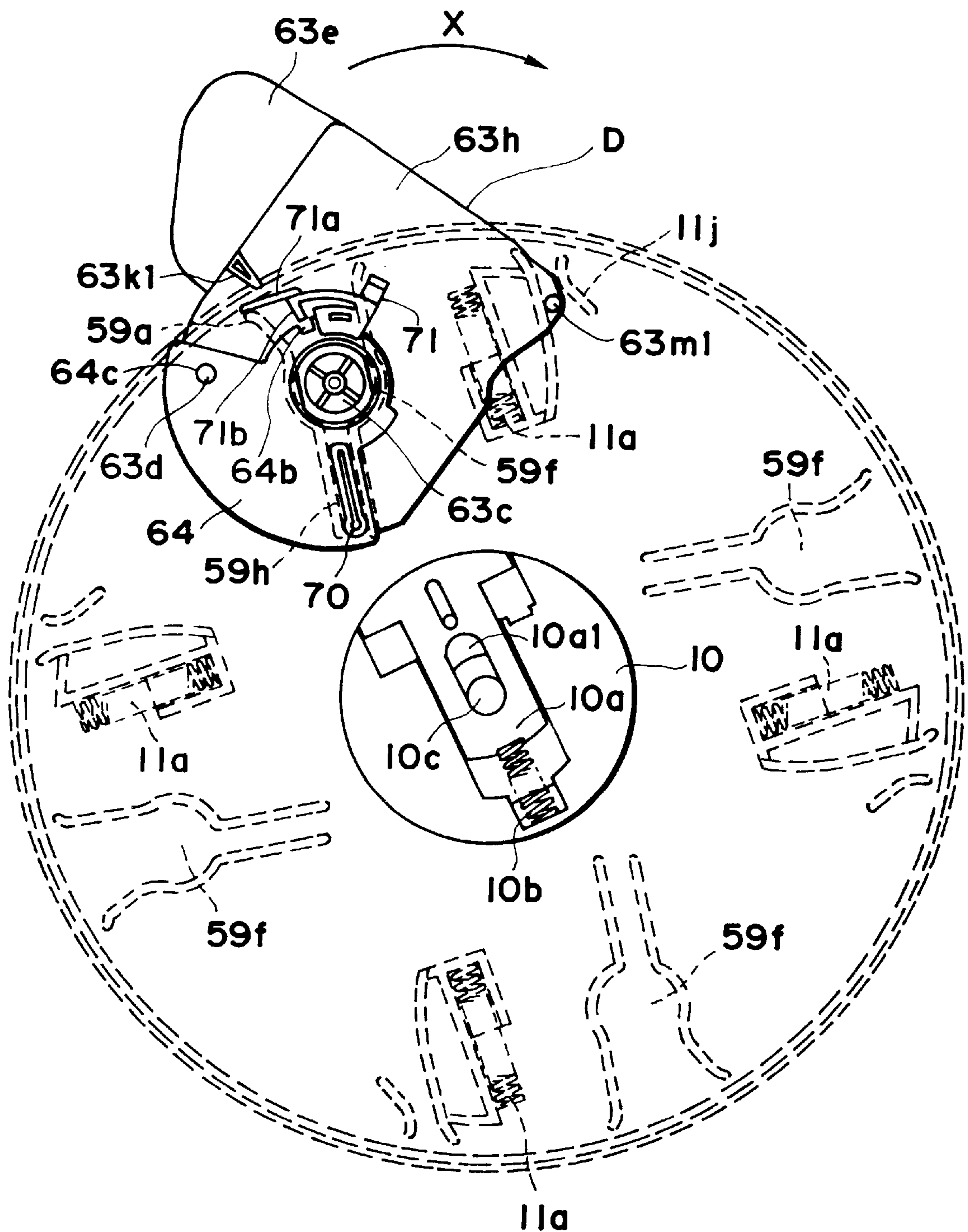


FIG. 22

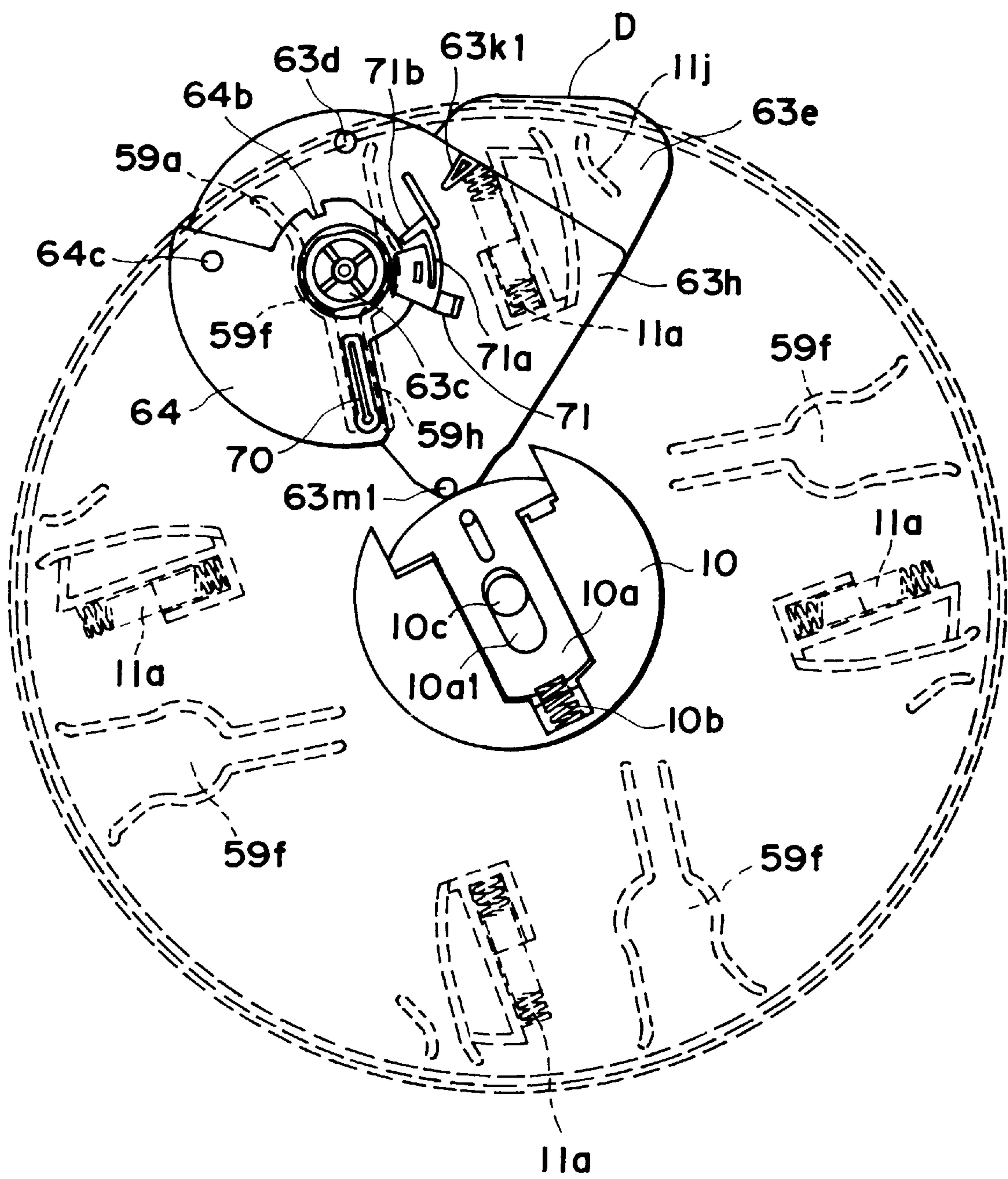


FIG. 23

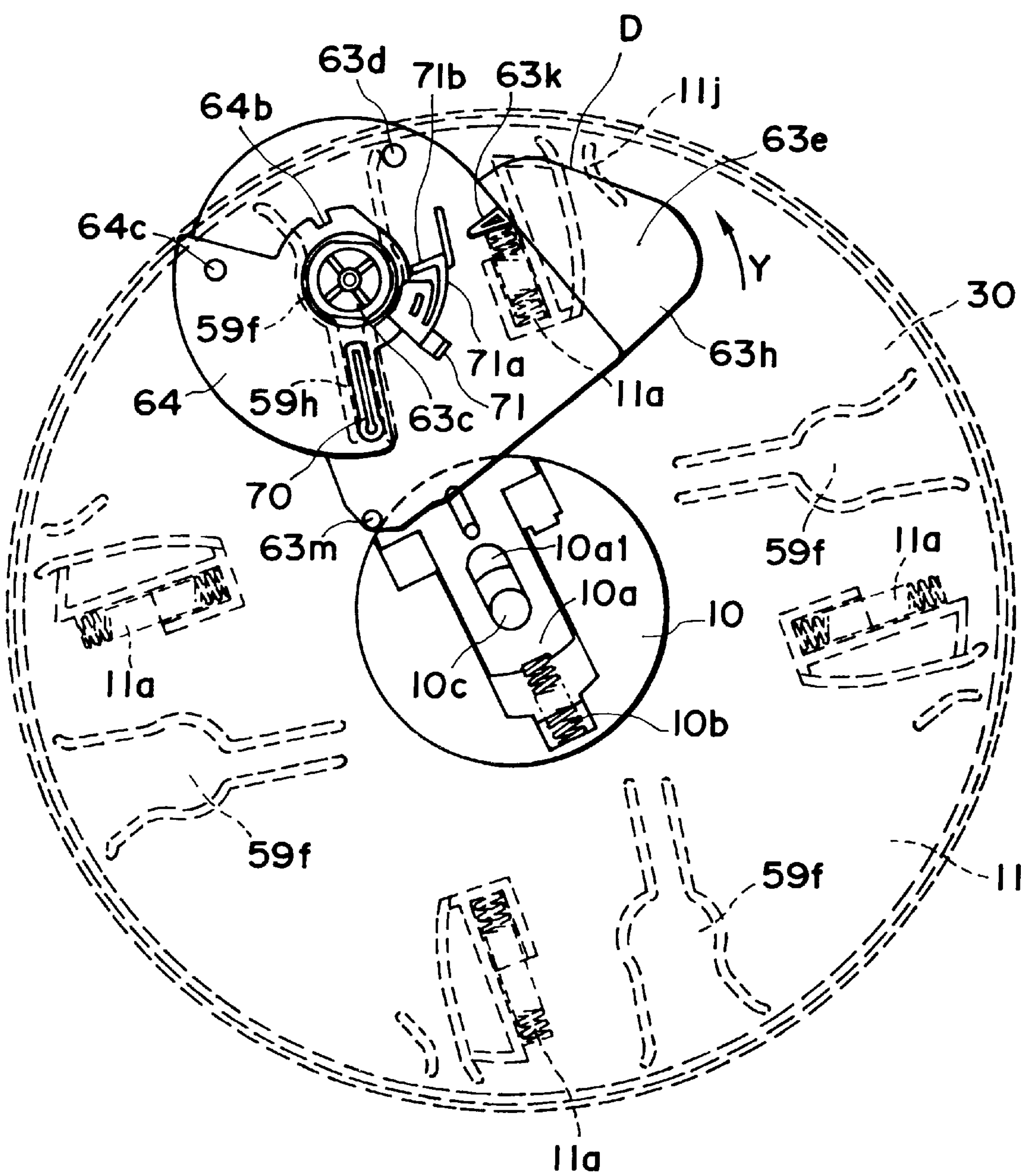


FIG. 24

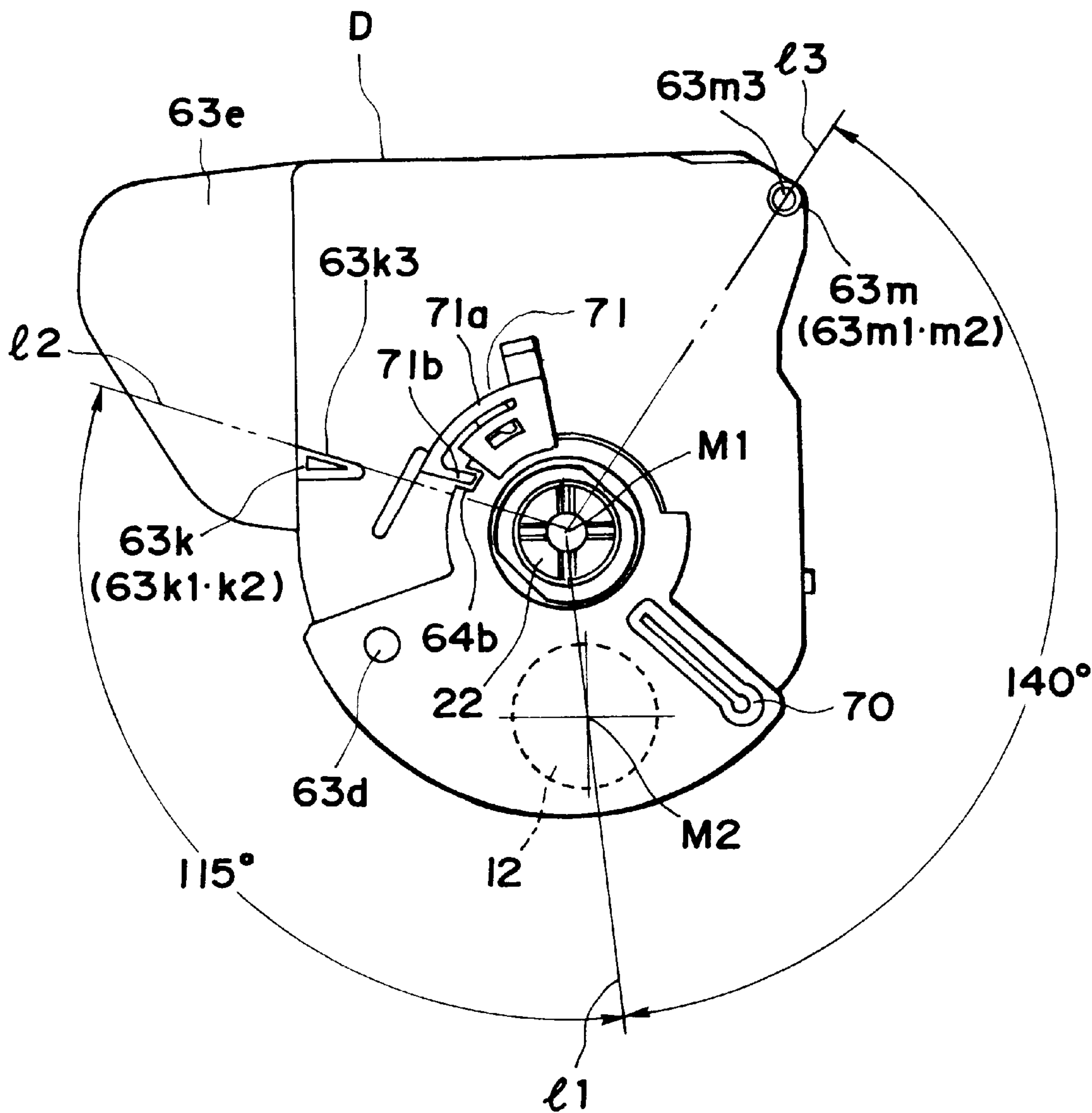


FIG. 25

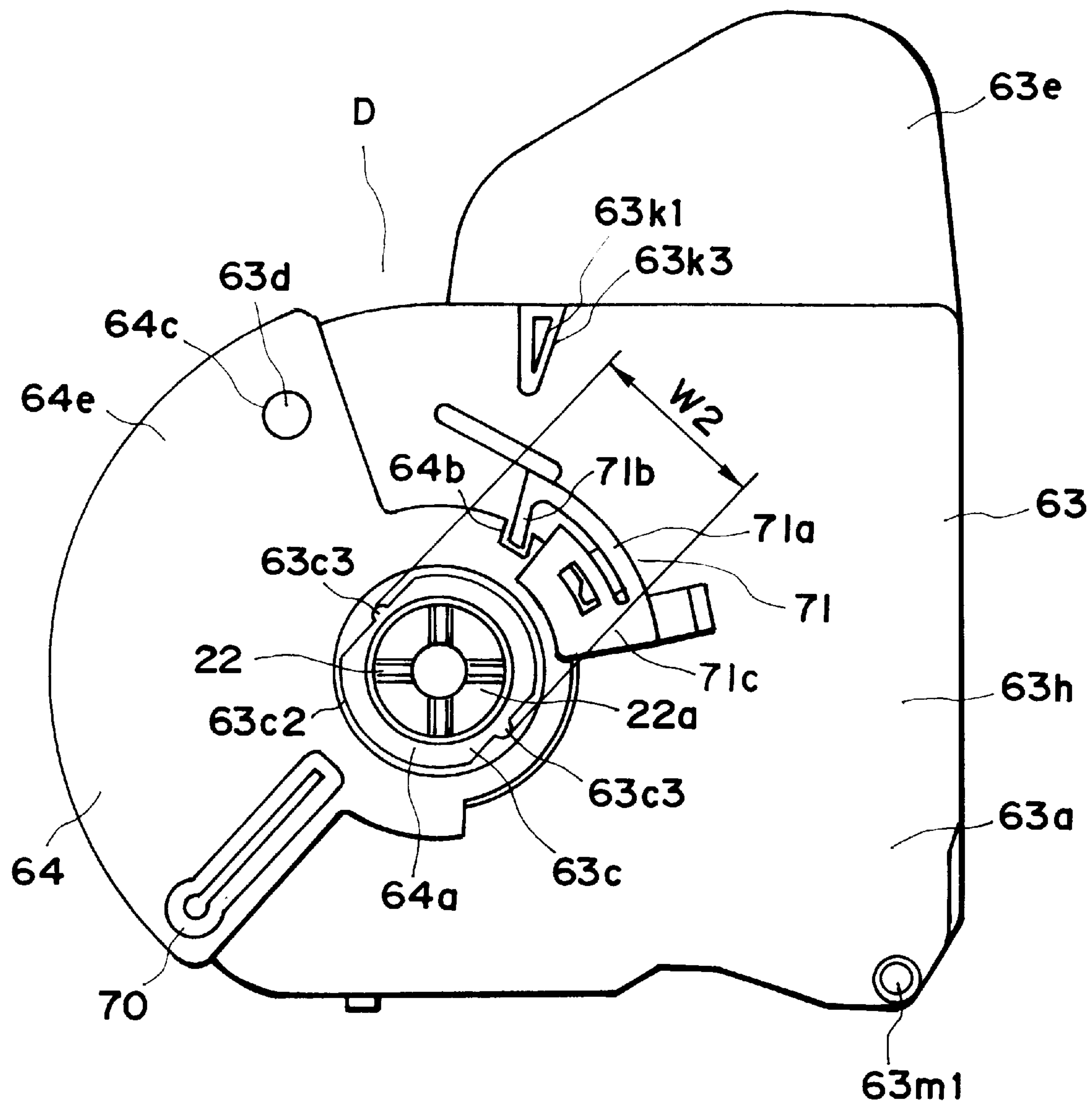


FIG. 26

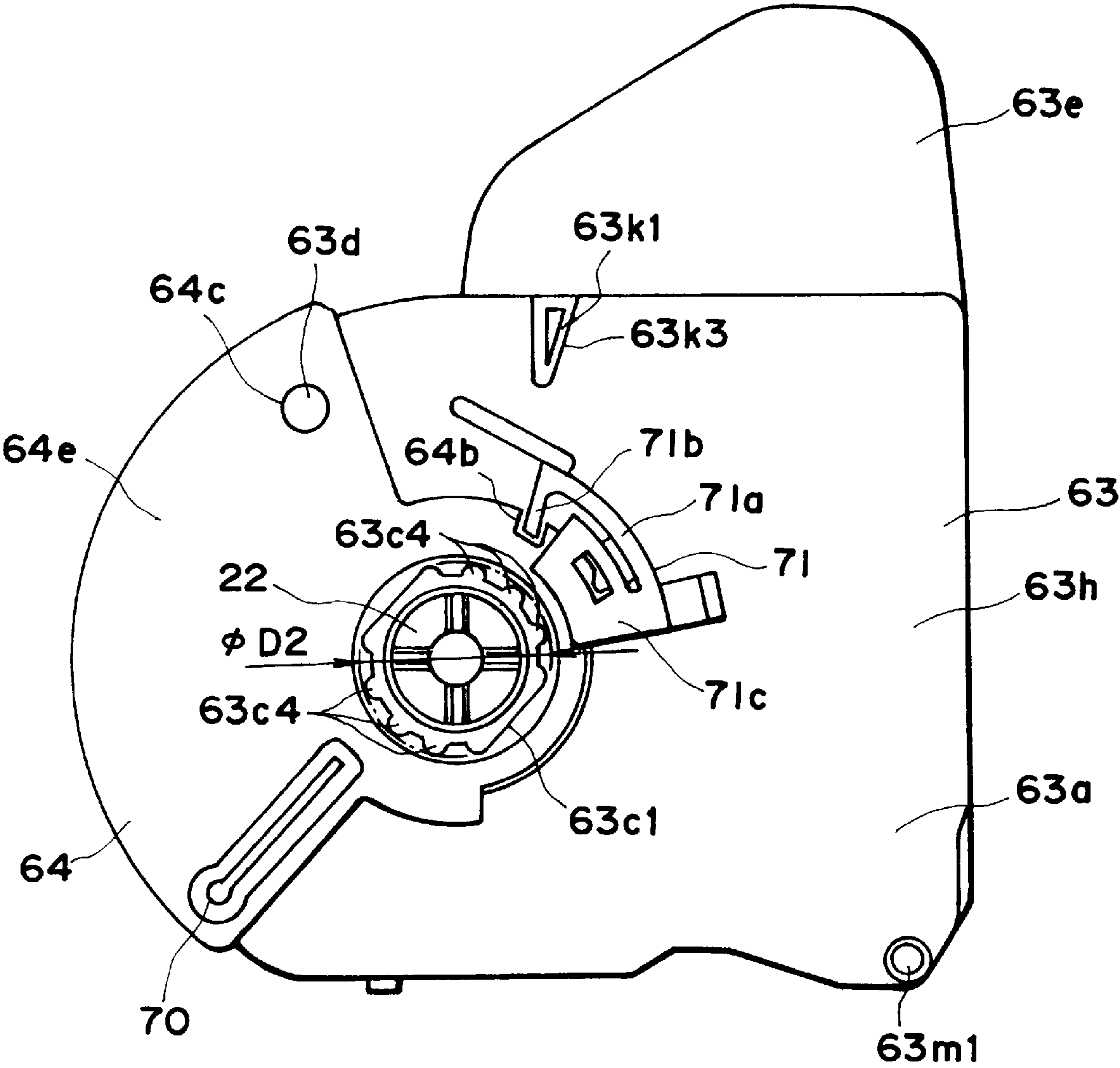


FIG. 27

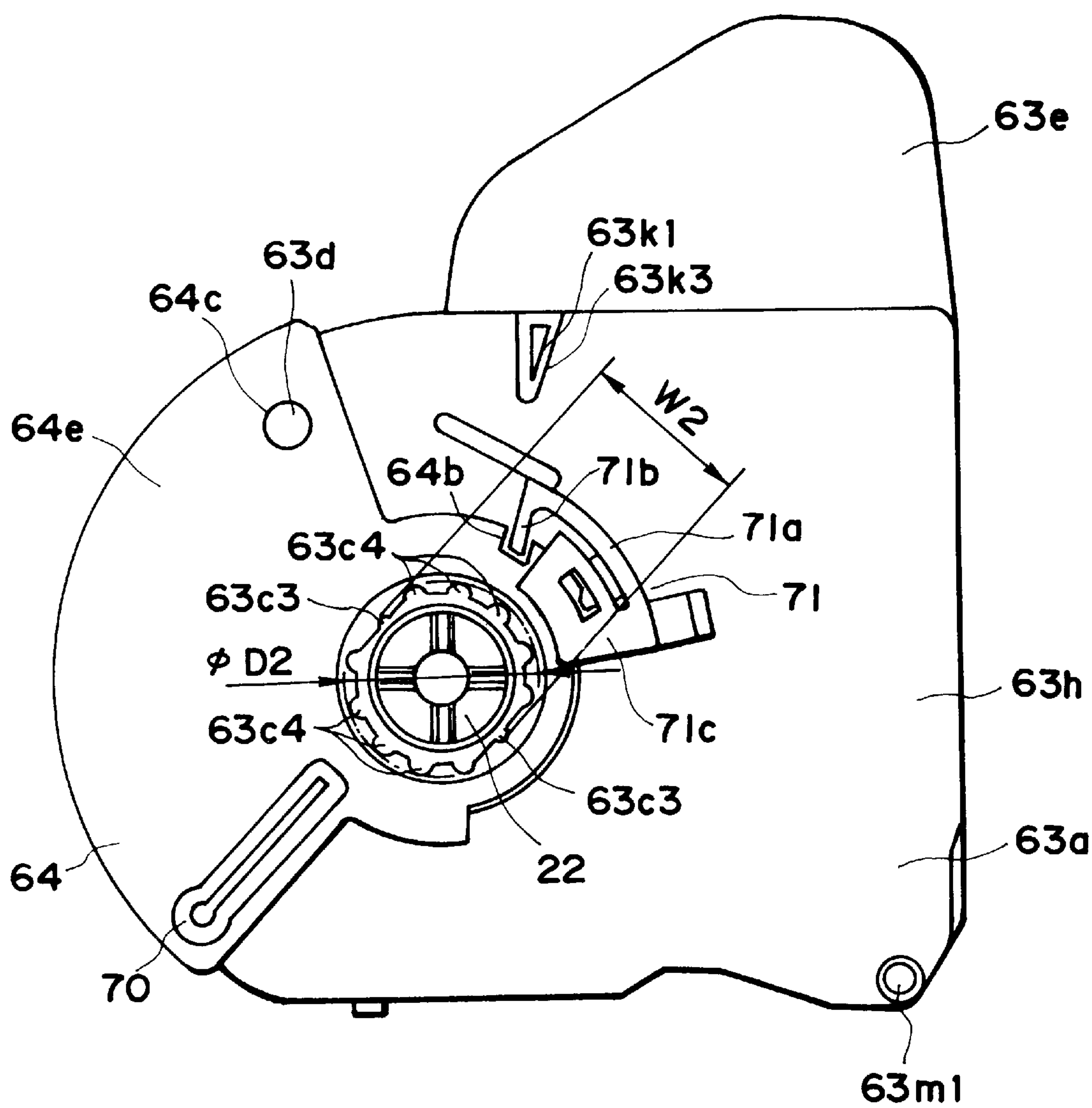


FIG. 28

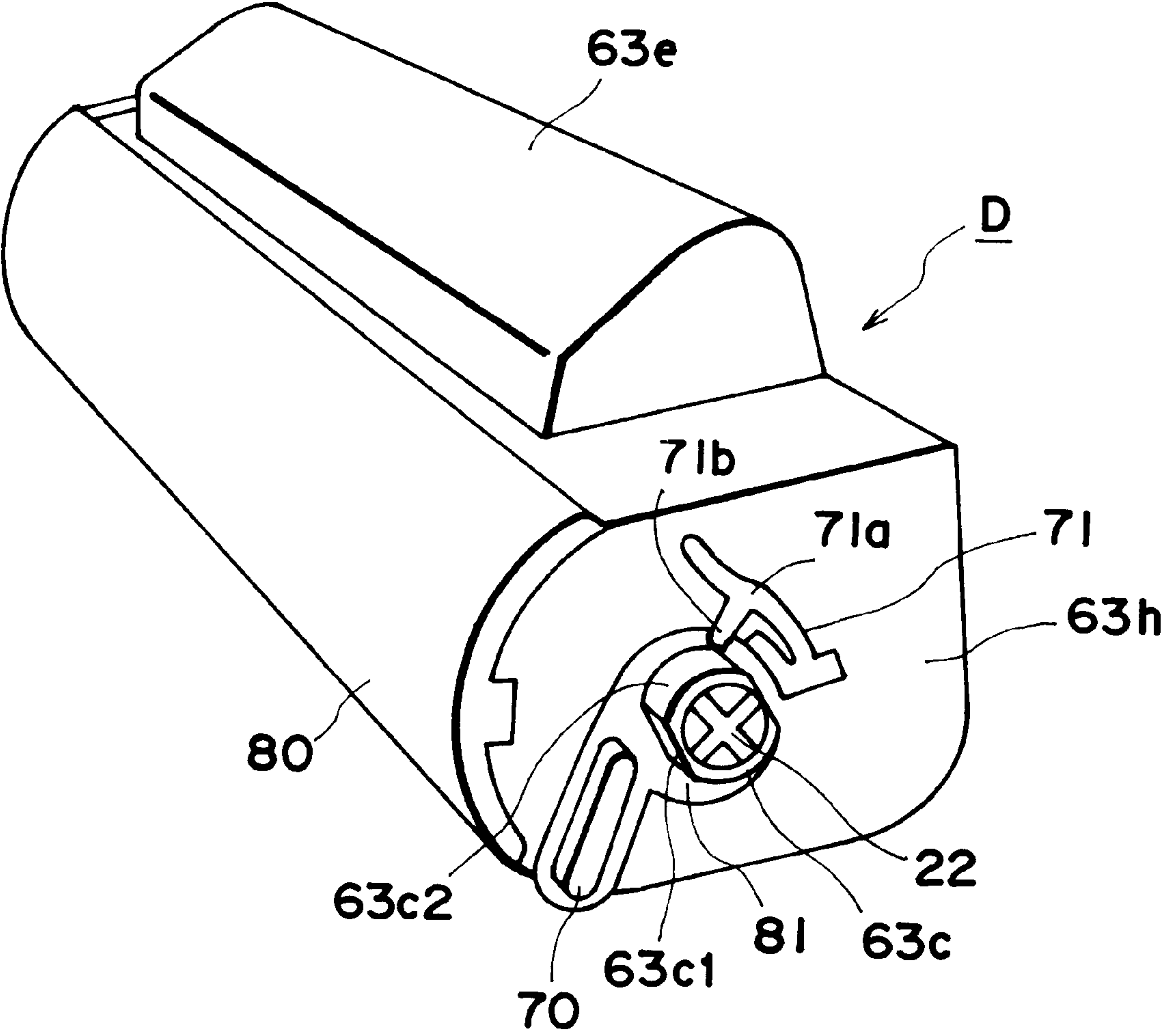


FIG. 29

DEVELOPING CARTRIDGE**BACKGROUND OF THE INVENTION****FIELD OF THE INVENTION**

The present invention relates to a developing cartridge for developing a latent image formed on an electrophotographic photosensitive member when an image is formed on a recording material through an electrophotographic process, and an electrophotographic image forming apparatus using the developing cartridge.

Heretofore, the following structure is known as a multi-color image forming apparatus for forming a multi-color image on a recording material through an electrophotographic process. A plurality of developing devices accommodating different color developers which are arranged on a rotation selection mechanism, are disposed around an electrophotographic photosensitive drum. A developing device accommodating a color developer is brought to face the photosensitive drum to develop a latent image thereon. The developed image is transferred onto the recording material. The developing and transferring operations are carried out for respective colors, so that a multi-color image is formed. The developing device is in the form of a cartridge which is detachably mountable to the main assembly of the image forming apparatus to facilitate the maintenance operation of the users.

Generally, the structure for inserting the developing device into the main assembly of the apparatus is such that the developing device is inserted in the longitudinal direction of the developing roller from a predetermined position, in order to reduce the area of the opening of the main assembly.

The present invention is intended to further improve such a developing device.

SUMMARY OF THE INVENTION

Accordingly, a principal object of the present invention is to provide a developing cartridge having improved operability and an image forming apparatus to which the developing cartridge is detachably mountable.

It is another object of the present invention to provide a developing cartridge which can be correctly positioned in a main assembly of an image forming apparatus, and to provide an image forming apparatus to which the developing cartridge is detachably mountable.

It is a further object of the present invention to provide a developing cartridge which is provided with a positioning member for positioning the cartridge in the main assembly of an image forming apparatus, and to provide an image forming apparatus to which the developing cartridge is detachably mountable.

It is a further object of the present invention to provide a developing cartridge having an outward projection to be supported by a supporting portion in a main assembly of an image forming apparatus, and to provide an image forming apparatus to which the developing cartridge is detachably mountable.

It is a further object of the present invention to provide a developing cartridge having an outward projection for receiving an urging force from an elastic member in a main assembly of an image forming apparatus, and to provide an image forming apparatus to which the developing cartridge is detachably mountable.

According to an aspect of the present invention, there is provided a developing cartridge for developing a latent

image formed on the photosensitive member, wherein the developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, the developing cartridge comprising: a cartridge frame; developing means for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when mounted to the main assembly of the electrophotographic image forming apparatus; a first projected portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means, wherein the first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when the cartridge is mounted to the main assembly; a second projected portion outwardly projected from the cartridge frame portion adjacent the other longitudinal end of the developing means, wherein the second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when the cartridge is mounted to the main assembly; a first urging force receptor portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means, wherein the first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when the cartridge is mounted to the main assembly; a second urging force receptor portion outwardly projected from the cartridge frame portion adjacent the other longitudinal end of the developing means, wherein the second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when the cartridge is mounted to the main assembly; a first contact portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means, wherein the first contact portion contacts a first fixed portion provided in the main assembly when the cartridge is mounted to the main assembly; a second contact portion outwardly projected from the cartridge frame portion adjacent one longitudinal end of the developing means, wherein the second contact portion contacts a second fixed portion provided in the main assembly when the cartridge is mounted to the main assembly.

These and other objects, features and advantages of the present invention will become more apparent upon a consideration of the following description of the preferred embodiments of the present invention taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an illustration of an electrophotographic image forming apparatus according to an embodiment of the present invention.

FIG. 2 is an illustration of a rotary unit and a developing cartridge.

FIG. 3 is an illustration of a developing cartridge.

FIG. 4 is an illustration of a mounting means for a developing cartridge, provided in the main assembly of an image forming apparatus.

FIG. 5 is a perspective view of a developing cartridge when the shutter is closed.

FIG. 6 is a perspective view of a developing cartridge when the shutter is opened.

FIG. 7 is an illustration of a developing cartridge when it is inserted into a main assembly.

FIG. 8 is an illustration of a developing cartridge when it is inserted into a main assembly.

FIG. 9 is an illustration of a developing cartridge when it is inserted into a main assembly.

FIG. 10 is an illustration of a developing cartridge when it is inserted into a main assembly.

FIG. 11 is an illustration of a drive transmission structure which stabilizes a positional relation between a developing roller and a photosensitive drum.

FIG. 12 is an illustration of a drive transmission structure which stabilizes a positional relation between a developing roller and a photosensitive drum.

FIG. 13 is an illustration of a structure for stabilizing the pressure of a developing roller relative to a photosensitive drum.

FIG. 14 is an illustration of a structure for stabilizing the pressure of a developing roller relative to a photosensitive drum.

FIG. 15 is an exploded perspective view of a developing cartridge according to another embodiment of the present invention.

FIG. 16 is a perspective view of a guide portion provided in the main assembly of the apparatus.

FIG. 17, (a), is a side view of the other end of the developing cartridge shown in FIG. 15 (shutter is closed), and (b) is a side view of one end of a developing cartridge shown in FIG. 15 (shutter is closed).

FIG. 18, (a), is a side view of the other end of the developing cartridge shown in FIG. 15 (shutter is open), and (b) is a side view of one end of a developing cartridge shown in FIG. 15 (shutter is open).

FIG. 19 is a perspective view of a guide portion in the main assembly of the apparatus.

FIG. 20 is a side view showing a process of mounting a developing cartridge to a rotary unit.

FIG. 21 is a side view showing a process of mounting a developing cartridge to a rotary unit.

FIG. 22 is a side view showing a process of mounting a developing cartridge to a rotary unit.

FIG. 23 is a side view showing a process of mounting a developing cartridge to a rotary unit.

FIG. 24 is a side view showing a process of mounting a developing cartridge to a rotary unit.

FIG. 25 is a side view showing a positional relation between a spring receptor and a boss.

FIG. 26 is a side view of a developing cartridge according to another embodiment.

FIG. 27 is a side view of a developing cartridge according to another embodiment.

FIG. 28 is a side view of a developing cartridge according to another embodiment.

FIG. 29 shows another embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

A developing cartridge and an electrophotographic image forming apparatus according to embodiments of the present invention will be described.

(First Embodiment)

Referring to FIGS. 1 to 12, the first embodiment of the present invention will be described. FIGS. 1 to FIG. 3 illustrate an electrophotographic image forming apparatus; FIGS. 4 to 5 are perspective views of a developing cartridge; FIGS. 6 to FIG. 10 are a mounting structure of the developing cartridge; and FIGS. 11 and 12, illustrate a drive transmission structure.

First, a description will be provided as to a general arrangement of the electrophotographic image forming apparatus, and then as to the structure of the developing cartridge.

(Electrophotographic Image Forming Apparatus)

The general arrangement of the electrophotographic image forming apparatus of this embodiment will be described. FIG. 1 is a side view of a laser beam printer as an exemplary image forming apparatus for forming a color image through an electrophotographic process. Charging means 2 uniformly charges a surface of an electrophotographic photosensitive member in the form of a drum (photosensitive drum) 1 which rotates at a constant speed. A laser beam corresponding to image information is projected through exposure means 3 onto the photosensitive drum 1 to form latent images thereon, which are developed by developing device Dy, Dm, Dc or Db. The developed images formed on the photosensitive drum 1 are superimposedly transferred sequentially onto an intermediary transfer member 4 so that a color image is formed. The color image is transferred by transferring means 6 onto a recording material P, such as recording paper, OHP sheet or the like fed by feeding means 5 from a sheet feeding portion. The recording material P is fed to fixing means 7, where the color image is fixed. The recording material P is then discharged to a discharging portion 8 at an upper surface of the device.

The structures of the respective portions will be described.

The photosensitive drum 1 is integrally mounted to a frame of cleaning means 9 for removing developer (toner) remaining on the photosensitive drum 1 after transfer of the toner image onto the recording material P, thus constituting a process cartridge (drum unit) U. The process cartridge U is demountably mounted to the main assembly of the image forming apparatus, and is exchanged by a user by himself when the lifetime of the photosensitive drum 1 ends.

The photosensitive drum 1 comprises an aluminum cylinder having a diameter of approximately 50 mm, and an organic photoconductive layer thereon, and is rotatably supported on a frame 9a of the cleaning means 9, which frame also functions as a holder for the photosensitive drum 1. Around the photosensitive drum 1, there are provided a cleaning blade 9b for scraping and removing the toner remaining on the photosensitive drum 1, and charging means 2. In this example, the photosensitive drum 1, the cleaning means 9 and the charging means 2 are unified into a process cartridge U detachably mountable to the main assembly of the apparatus.

The photosensitive drum 1 receives a driving force from an unshown driving motor to rotate in the counterclockwise direction in FIG. 1 in accordance with an image forming operation.

The charging means 2 in this example is of contact charging type, and comprises a rotatable electroconductive roller in contact with the surface of the photosensitive drum 1, which roller is supplied with a voltage to uniformly charge the surface of the photosensitive drum 1.

In the exposure means 3 for exposing the charged photosensitive drum 1, an image signal is supplied to an unshown laser diode, in response to which the laser diode projects the image light corresponding to the image signal onto the polygonal mirror 3a. The polygonal mirror 3a is rotated at a high speed by a scanner motor 3b, and the image light reflected by the mirror 3a is projected onto the photosensitive drum 1 rotating at a constant speed through an imaging lens 3c and a reflection mirror 3d, so that surface of the photosensitive drum 1 is imagewise exposed to the light, thus forming an electrostatic latent image.

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The latent image is developed for each color by the latent image developing cartridge (developing device). The structure of the developing cartridge will be described, hereinafter.

The toner image developed by the developing cartridge is transferred onto the intermediary transfer member 4. Onto the intermediary transfer member 4, four color toner images on the drum are sequentially and superimposedly transferred. Therefore, the intermediary transfer member 4 is rotated clockwise in FIG. 1 in synchronism with the outer peripheral speed of the photosensitive drum 1. The intermediary transfer member 4 having the toner images is passed to sandwich the recording material P with a transfer roller 6 as transferring means supplied with a voltage, by which the toner images are simultaneously transferred from the intermediary transfer member 4 onto the recording material P.

The intermediary transfer member 4 in this example comprises an aluminum cylinder having an outer diameter of approximately 150 mm, and an elastic layer of a material such as an intermediate resistance sponge, an intermediate resistance rubber or the like thereon. It is rotated by a gear fixed thereto.

After the toner image is transferred onto the intermediary transfer member 4, a small amount of toner remains on the surface of the photosensitive drum 1, and is removed by cleaning means 9. The cleaning means 9 has a cleaning blade 9b which contacts the drum surface and which scrapes the toner off the drum surface. The scraped toner is accumulated in a toner container 9c. The capacity of the container 9c is such that it is not filled with the removed toner accumulated before the lifetime of the photosensitive drum 1 ends. The removed toner in the container 9c is taken out by exchange of the drum unit U when the life of the photosensitive drum 1 ends.

The transferring means for transferring the toner images from the intermediary transfer member 4 onto the recording material P, is in the form of a transfer roller 6 in this example, and the roller 6 comprises a metal shaft and an intermediate resistance foamed-elastic-member thereon, and is vertically movable in FIG. 1.

The transfer roller 6 takes a solid line position in FIG. 1 (lower position) away from the intermediary transfer member 4 so that it does not disturb the image while the four toner images are being transferred thereonto, that is, while the intermediary transfer member 4 is rotated a plurality of times.

After the toner images are superimposedly transferred onto the intermediary transfer member 4, and the color image formation is completed on the intermediary transfer member 4, the transfer roller 6 is moved to the upper position indicated by the chain line in FIG. 1 by an unshown cam at a timing for transfer of the color image onto the recording material P. Thus, the roller press-contacts the recording member P to the intermediary transfer member 4 at a predetermined time. Simultaneously with this, the transfer roller 6 is supplied with a bias voltage so that a toner image is transferred from the intermediary transfer member 4 onto the recording material P.

The feeding means 5 for feeding the recording material P, comprises a cassette 5a accommodating a plurality of recording materials P, a pick-up roller 5b, feeding rollers 5c1, retarding rollers 5c2 for preventing double feeding, a pair of feeding rollers 5d, a pair of registration rollers 5e, a pair of discharging rollers 5f, and a feeding guide 5g.

At the time of the image formation, the pickup roller 5a is rotated in the image forming operation, so that recording material P in the cassette 5a is separated and fed in seriatim.

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The recording material is fed out of the cassette 5a, and is guided by the feeding guide 5f, and then is fed to the pair of registration rollers 5e via the pair of feeding rollers 5d. In the image forming operation, the registration roller 5e is at rest for stopping and retaining the recording material P, and is rotated to feed the recording material P to the intermediary transfer member 4 at a predetermined sequence to align the recording material P with the intermediary transfer member 4 for the transfer process. Then, the color image is transferred by the transferring means.

The recording material P now having the transferred color image is fed to the fixing means 7 where the toner image is fixed. The fixing means 7 comprises a fixing roller 7a for applying heat to the recording material P, and a pressing roller 7b for press-contacting the recording material P to the fixing roller 7a. These rollers 7a, 7b are hollow rotatable rollers, and have heaters therein. The toner image is fixed on the recording material P while the recording material P is being fed therethrough while being pressed and heated.

The recording material P on which the toner image is fixed, is discharged to the discharging portion 8 by the discharging rollers 5f (feeding means).

(Developing Cartridge (Developing Device))

A description will be provided as to the developing cartridge for developing the latent image formed on the photosensitive drum 1.

The image forming apparatus has four developing cartridges D (Dy, Dm, Dc, Db) for development in four colors (yellow, magenta, cyan and black) to form a full-color image. The developing cartridges D, as shown in FIGS. 1 and 2, are demountably mounted on a rotary unit 11 which is rotatable about a shaft 10. In the image formation operation, each developing cartridge D is revolved while being supported on the rotary unit 11, about the shaft 10. A developing cartridge D accommodating predetermined color toner is stopped at a development position facing the photosensitive drum 1. The developing roller which will be described hereinafter is positioned with a small clearance relative to the photosensitive drum 1 (approximately 300 pm), and then the toner is supplied to the electrostatic latent image on the photosensitive drum 1 to develop the latent image.

During color image formation, the rotary unit 11 is rotated for each rotation of the intermediary transfer member 4 to permit developing operations of the yellow developing cartridge Dy accommodating the yellow color toner, the magenta developing cartridge Dm accommodating the magenta color toner, the cyan developing cartridge Dc accommodating the cyan color toner, and the black developing cartridge Db accommodating the black color toner, in this order.

FIG. 3 shows a developing cartridge D (yellow developing cartridge Dy, for example) placed at the development position faced to the photosensitive drum 1. The developing cartridge D comprises a developing roller 12 as a toner carrying member for supplying the toner to the photosensitive drum 1, and a toner accommodating portion 13a for accommodating the toner to be supplied to the developing roller 12. It further comprises a frame 13 for supporting the developing roller 12, and a shutter 14 for an opening provided in the frame 13 to expose the developing roller 12. Furthermore, it comprises a toner feeding member 15 in the toner accommodating portion 13a. A fresh developing cartridge is provided with a toner seal 30 for preventing leakage of the toner accommodated in the toner accommodating portion 13a. A user pulls out the toner seal 30 prior to the mounting of the fresh developing cartridge to the main

assembly of the apparatus to open the toner accommodating portion **13a**. By this, the toner in the toner accommodating portion **13a** is permitted to be supplied to the developing roller **12**.

The toner feeding member **15** is rotated by the driving force from the main assembly of the apparatus to feed the toner from the accommodating portion **13a** to the developing roller **12**. The developing roller **12** is a rotatable aluminum roller, and a development blade **16** is press-contacted to the peripheral surface of the developing roller **12**. By this, when the developing roller **12** is rotated in the counterclockwise direction in FIG. **3**, the toner is applied on the peripheral surface as a thin layer, and the toner is supplied with electric charge (triboelectric charge).

The developing roller **12** facing the photosensitive drum **1** having a latent image, is supplied with a developing bias, so that a toner image is formed on the photosensitive drum **1** in accordance with the latent image.

The above-described structure and the developing process are the same in the yellow developing cartridge **Dy**, the magenta developing cartridge **Dm**, the cyan developing cartridge **Dc** and the black developing cartridge **Db**. The developing roller **12** of each developing cartridge **D** is connected with the driving source and high voltage generating source for each color development provided in the main assembly of the image forming apparatus when the developing cartridge **D** is moved to a development position, so that a developing bias voltage for each developing cartridge **D** is sequentially applied thereto, and the driving force is transmitted to rotate the developing roller **12** or the like.

A description will be provided as to the structure for mounting the developing cartridge **D** to the main assembly **30** of the image formation device. As shown in FIGS. **1** to **4**, at a predetermined position of the main assembly **30** of the image forming apparatus, an insertion opening **17** having a width not less than the longitudinal direction length of the developing cartridge **D**, is formed, and a cover **18** is openable mounted in the insertion opening **17**. The insertion opening **17** is normally closed by a cover **18**.

The main assembly of the apparatus **30** is provided with a developing device exchange switch (unshown). When the developing cartridge **D** is exchanged after the toner therein is consumed, the user actuates the switch. Then, the rotary unit **11** rotates to bring the developing cartridge to be replaced to the position of the insertion opening **17**.

When the user opened the cover **18**, guides **19** constituting the mounting means for the developing cartridge **D** are provided at four positions of the rotary unit **11** in the main assembly **30** of the image forming apparatus. On the other hand, the shutter **14** of the developing cartridge **D** is provided with guide portions **20** as shown in FIGS. **5** to **10**. By inserting the cartridge so that guide portion **20** is guided along the guide **19**, the developing cartridge **D** is inserted into the main assembly **30** of the image forming apparatus. The guide **19** and the guide portion **20** are extended in the longitudinal direction (the direction of the rotation axial direction) of the developing cartridge **D** at both sides (only one side is shown in FIGS. **4** and **5**).

After the developing cartridge **D** is inserted into the main assembly of the apparatus in a direction crossing with the longitudinal direction of the developing roller **12** in this manner, the user rotates the developing cartridge **D**. The shutter **14** is opened, and the developing roller **12** faces the photosensitive drum **1** exposed through the frame **13**, so that the developing operation is enabled.

In this example, the rotary unit **11** as the mounting member carries the black developing cartridge **Db** for devel-

oping the latent image using the black color toner, the yellow developing cartridge **Dy** for developing the latent image using yellow color toner, the magenta developing cartridge **Dm** for developing the latent image using the magenta color toner, and the cyan developing cartridge **Dc** for developing the latent image using the cyan color toner.

The structures of the guide **19** and the shutter **14** will be described.

As shown in FIG. **6**, the frame **13** of the developing cartridge **D** is provided with an opening **13b** extending in the longitudinal direction, and the developing roller **12** is mounted on the frame **13** so as to be exposed through the opening **13b**. Substantially at a central portion of each longitudinal end side of the frame **13**, a projected portion **13c** integral with the frame **13** is formed. The projected portion **13c** functions as a guide when the developing cartridge **D** is inserted into the main assembly **30** of the image forming apparatus and as a center of rotation for the developing cartridge **D**. At least one of the projected portions **13c** is cylindrical.

In both side walls of the shutter **14**, round holes **14a** are formed, and by engaging the projected portion **13c** with the round hole **14a**, the shutter **14** is rotatably mounted on the frame **13**. As shown in FIG. **5**, when the shutter **14** is closed, the opening **13** is closed so that developing roller **12** is covered by the shutter **14**. When the developing cartridge **D** is out of the main assembly of the apparatus **30**, the shutter **14** is closed, so that developing roller **12** is protected from deposition of foreign matter such as dust, and the roller **12** or the like is protected from damage.

Adjacent to the projected portion **13c** of the frame **13**, there is provided a locking member **21** for locking the shutter **14** in the closed state. The locking member **21** has an engaging portion **21b** in an arm portion **21a** as a supporting portion having elastic. On the other hand, a shutter engagement recess **14b** as an engaging portion is provided at a predetermined position of the shutter side wall.

By this, as shown in FIG. **5**, when the shutter **14** is in the closed position, the engaging portion **21b** is engaged with the engagement recess **14b** so that shutter **14** is locked in the closed state, thus preventing unintended opening thereof.

When the developing cartridge **D** is mounted on the main assembly **30** of the image forming apparatus, the locking is automatically released to permit the opening of the shutter **14**. This will be described in more detail.

As shown in FIGS. **4-7**, the guide **19** provided on the inner wall of the rotary unit **11**, comprises two guiding member inserting portions **19a** which are substantially parallel with each other, and a projection inserting portion **19b** comprising a linear rib **19b1** and an arcuate rib **19b2**. When the developing cartridge **D** is inserted into the main assembly of the apparatus, the user causes the guide portion **20** of the shutter **14** to be guided by the guide inserting portion **19a**, and inserts the developing cartridge **D**.

When the developing cartridge **D** is inserted, the projections **13c** of the developing cartridge **D** are brought to the linear portions of the projection inserting portions **19b**, as shown in FIG. **8**. The projected portion **13c** has cutting portions **13c1** which are provided by linearly cutting the cylindrical **1** portion in a direction parallel with the linear rib **19b1**. The two linear ribs **19b1** engageable therewith, each have a width for permitting movement of the cutting portion **13c1** only in the direction parallel with the cutting portions **13c1**. Therefore, when the developing device **D** is inserted into the main assembly of the apparatus **30**, it is maintained at a predetermined angle (orientation) by the cutting portions **13c1** and the linear ribs **19b1**.

When the projections **13c** are inserted to the arcuate rib **19b2**, as shown in FIG. 9, a leading end of one of the linear ribs **19b1** is abutted to the arm portion **21a** which locks the shutter **14** to raise it upwardly as shown in FIG. 9. By this, the arm portion **21a** is elastically deformed so that engaging portion **21b** is releasable from the engagement recess **14b**, and therefore, the locking of the shutter **14** is released (namely, in this embodiment, the linear rib **19b1** is a releasing means for the locking member **21**). With this state, the shutter **14** is in a rotatable state relative to the development cartridge frame **13**. The arcuate rib **19b2** has a radius for permitting rotation of the cylindrical projected portion **13c**, and the developing cartridge D is in a rotatable state about the cylindrical projected portion **13c**.

At both longitudinal ends of the developing cartridge frame **13**, projections **13d**, which are semispherical engaging portions, are provided as shown in FIG. 9, and correspondingly, the shutter **14** has holes **14c** which are to be engaged with the projections **13d**. Therefore, when the shutter **14** is closed, the projections **13d** are engaged with the holes **14c**. So, even if the locking by the locking member **21** of the shutter **14** is released, the developing cartridge frame **13** is prevented from rotating to an unstable position relative to the shutter **14**.

Subsequently, as shown in FIG. 10, the user presses the grip portion **13e** of the frame **13**. At this time, the cylindrical projected portion **13c** of the frame **13** is rotatable in the arcuate rib **19b2** although the shutter **14** is not, because the guide portion **20** is sandwiched by the guide portion inserting portion **19a**. Therefore, the semi-spherical projection **13d** rotates to the predetermined position beyond the hole **14c** of the shutter **14** (x direction in FIG. 10). Since the shutter **14** is provided with the insertion guide portion **20**, the frame **13** is easily rotated while the shutter **14** is in the fixed state. When it is rotated to a predetermined position, the frame **13** is positioned by a positioning means (unshown), so that developing cartridge D is mounted in place.

By this, the shutter **14** is opened to expose and face the developing roller **12** to the photosensitive drum **1**. During this mounting operation, the user can feel the rotation start position for the developing cartridge D on the basis of the click feeling provided by the removal of the semi-spherical projection **13d** from the hole **14c** of the shutter **14**.

The diameter of the arcuate portion of the projected portion **13c** is larger than the distance between the cutting portions **13c1**, and therefore, the projected portion **13c** is not disengaged from the linear rib **19b1** when the projected portion **13c** is rotated at the position of the arcuate rib **19b2**.

On the other hand, when the developing cartridge D is removed from the main assembly **30** of the image forming apparatus, the user rotates the frame **13** in the direction opposite from the foregoing, the cutting portions **13c1** become parallel with the linear rib **19b1**, and the shutter **14** is closed. The user can feel the rotation completion position of the developing cartridge D on the basis of the click feeling upon the engagement of the semi-spherical projection **13d** into the hole **14c**. When the developing cartridge D is pulled out of the main assembly of the apparatus **30**, the situation is as shown in FIG. 8, so that arm portion **21a** of the locking member **21** elastically restores to engage the locking portion **21b** into the engagement recess **14b**. By this, the shutter **14** is automatically locked.

By the provision of the shutter **14** in the developing cartridge D, the developing roller **12** is prevented from being contaminated by dust or the like. Since the shutter **14** is provided with a locking mechanism, the shutter **14** is prevented from inadvertent opening.

When the developing device is inserted into the main assembly **30** of image forming apparatus, the shutter **14** maintains its closed state, and therefore, the developing roller **12** is not damaged during insertion. In addition, the user is not required to remove the developing roller protection member by his hands before insertion of the developing cartridge as in a conventional system.

Furthermore, the shutter locking is automatically released when the developing cartridge is mounted to the main assembly **30** of the image forming apparatus, and only by rotation thereof after the insertion, the shutter **14** is released, and the developing roller **12** is faced to the photosensitive drum **1**, thus completing the mounting operation. Thus, mounting operativity is improved.

A description will be provided as to a drive transmission structure from the main assembly of the apparatus to the developing cartridge D.

As shown in as shown in FIGS. 11 and 12, a driving force receptor **22** for receiving a driving force from the main assembly of the apparatus **30** to rotate the developing roller **12**, is provided in one of the cylindrical projected portions **13c** at one of the frame ends. The gear **23a** meshes with a roller gear **23b** mounted on the rotation shaft of the developing roller **12**. When the driving force is transmitted to the receptor **22**, the developing roller **12** rotates. The gear **23a** is meshed also with the gear **23b** mounted on the rotation shaft of the toner feeding member **15** through a gear **23c** to transmit the rotating force to the toner feeding member **15**.

The end of the driving force receptor **22** is in the form of a rib, which constitutes a coupling connectable with a drive transmission member of the main assembly of the apparatus.

On the other hand, the rotary unit **11** in the main assembly **30** of the image forming apparatus, is provided with a drive transmission member **24** for transmitting the driving force from a motor N, on the shaft facing the driving force receptor **22** when the developing cartridge D is mounted in place. The transmitting mechanism for transmitting the driving force to the drive transmission member **24** from the motor M, is schematically shown by chain lines. The drive transmission member **24**, as shown in FIG. 11, is mounted for movement toward the shaft of the driving force receptor portion **22**, and the end thereof is formed into a coupling engageable with the rib of the driving force receptor. The coupling has any shape by which when the drive transmission member **24** is moved to the receptor **22**, they are engaged, and when one rotates the other rotates. In this example, the receptor **22** has a plurality of recesses **22e**, and the drive transmission member **24** is provided with a plurality of projections **24a**, correspondingly. By rotation of the drive transmission member **24** while the meshing engagement between the recess **22a** and the projection **24a** is maintained, the driving force receptor portion **22** is rotated.

When the developing cartridge D is moved by rotation of the rotary unit **11** in the image formation, the drive transmission member **24** is moved toward the receptor **22** by a moving mechanism (unshown), and is engaged therewith to permit transmission of driving force to the developing roller **12** or the like. By this structure, even if the stop position of the developing cartridge D relative to the photosensitive drum **1** is more or less deviated, or even if the generating lines of the photosensitive drum **1** and the rotary unit **11**, are more or less deviated, the driving force transmission to the developing cartridge D is properly transmitted from the same position, and only the driving torque is transmitted, so that the influence of the meshing off-set between gears due to pitch nonuniformity or the like can be reduced.

(Second Embodiment)

Referring to FIGS. 13 and 14, a description will be provided as to a structure for stabilizing the pressure of the developing roller 12 to the photosensitive drum 1, according to a second embodiment of the present invention. The same reference numerals as in Embodiment 1 are assigned to the elements having the corresponding functions, and detailed descriptions thereof are omitted for simplicity.

As described in the first embodiment, the developing cartridge D receives the rotating force at the driving force receptor from the drive transmission member 24 of the main assembly 30 of the image forming apparatus at the development position.

As shown in FIG. 13, a line X1 is defined as a line connecting a rotation center of the developing cartridge D about the projected portion 13c and the center of rotation of the photosensitive drum 1, and a line X2 is defined as a line connecting the rotation center of the projected portion 13c and the center of rotation of the developing roller 12. When the developing cartridge D is at the development position, the line X2 is located upstream of the line X1 with respect to the driving rotational direction R toward the driving force receptor 22, as seen from the rotation center of the projected portion 13c.

By this structure, the developing roller 12 receives normally the force to bite into the photosensitive drum 1, so that developing roller 12 is stably urged toward the photosensitive drum 1 normally. This is advantageous in so-called contact development, but it particularly advantageous in non-contact development since the gap is stabilized.

As shown in FIG. 14, consideration will be made as to the case where an urging means is provided to fix the developing cartridge while urging it toward the photosensitive drum 1 when the developing cartridge is at the development position. When M is a direction of the moment produced in the developing cartridge D by the urging direction P of the urging means, designated by X1 is a line connecting the center of rotation of the developing cartridge D provided by the projected portion 13c and the center of rotation of the photosensitive drum 1, designated by X2 is a line connecting the rotation center of the projected portion 13c and the center of rotation of the developing roller 12; and the line X2 is located upstream of the line X1 with respect to the moment direction M as seen from the rotation center of the projected portion 13c. The same effects are provided with this structure, too. The urging means urges the rear surface portion adjacent the toner accommodating portion 130 at each of the longitudinal ends of the developing cartridge D.

(Third Embodiment)

Referring to FIGS. 15 to 24, another embodiment of the developing cartridge D will be described. In this embodiment, the developing cartridge D is demountably mountable relative to the full-color laser beam printer shown in FIG. 1.

Also, the developing cartridge D comprises a developing roller 12, a development blade 16 and toner accommodating portion 63a in the cartridge frame 63.

When the user opens the cover 18, guides 59 constituting mounting means for the developing cartridge D are provided at four positions 4 of the rotary unit 11 in the main assembly 30 of the image forming apparatus. On the other hand, the shutter 64 of the developing cartridge D is provided with a guide portion 70, as shown in FIGS. 15, 17 and FIG. 18. By inserting the cartridge so that guide portion 70 is guided along the guide 19, the developing cartridge D is inserted into the main assembly 30 of the image forming apparatus. The guide portion 70 is provided only on one side (in the

longitudinal direction or the rotation axial direction of the developing roller 12) of the developing cartridge D. Therefore, the guide 59 is also provided only on one of the wall surfaces 11a of the rotary unit 11.

The developing cartridge D is inserted to the rotary unit 11 in a direction crossing with the longitudinal direction of the developing roller 12 with the developing roller 12 being at a leading side, while the user grips the grip 63e.

After the developing cartridge D is inserted to the main assembly of the apparatus 30, the user rotates the developing cartridge D, by which the shutter 64 is opened to permit the developing roller 12 to be exposed and faces the frame 63 to the photosensitive drum 1, thus enabling the developing operation.

The developing cartridge D mounted to the mounting position of the rotary unit 11 is urged in the longitudinal direction by a spherical urging member 26b positioned at the arcuate engaging portion 26a of the guide 26 provided on the other wall surface 11b of the rotary unit 11 (namely, urged to the side having the driving force receptor 22). The urging member 26b is urged elastically by a spring (unshown). The developing cartridge D is urged toward the driving side. Therefore, the developing cartridge D is mounted to the rotary unit 11 (main assembly of the apparatus), using as a reference the side having the driving force receptor member 22 in the longitudinal direction of the developing roller 12.

The developing cartridge D will be described in more detail, referring to FIGS. 15, 17, (a), (b), and FIG. 18, (a) and (b), FIG. 16 is a perspective view of the developing cartridge D wherein shutter 64 or the like is omitted. FIG. 17, (a), (b), are both side views of the developing cartridge D when the shutter 64 is closed, and FIGS. 18, (a), (b), are both side views of the developing cartridge when the shutter 64 is opened.

As shown in FIG. 15, the frame 63 of the developing cartridge D is provided with an opening 63b extended in the longitudinal direction, and the developing roller 12 is mounted on the frame 63 so as to be exposed through the opening 63b. Substantially at a central portion of one longitudinal direction end side 63h of the frame 63, a projected portion 63c integral with the frame 13 is formed. The projected portion 63c functions as a guide when the developing cartridge D is inserted into the main assembly 30 of the image forming apparatus and as a center of rotation for the developing cartridge D. The projected portion 63c is cylindrical.

At substantially the central portion of the other side of the frame 63, a projected portion 63g is demountably mounted on the frame 63 (frame 63 shows the demounted state). The projected portion 63g is mounted to the frame 63 by inserting the inserting portion 63g1 into a hole (unshown) formed in the side 63i. The end of the inserting portion 63g1 is provided with a claw configuration portion (unshown), and by engaging the claw portion with the frame 63, projected portion 63g is mounted on the frame 63. When the developing cartridge D is mounted to the mounting position of the rotary unit 11, the end surface 63g2 of the projected portion 63g is urged to the member 26b. Therefore, the developing cartridges D is urged toward the side 63h (in the direction indicated by the arrow Q). The developing cartridge D is mounted to the rotary unit 11 of the main assembly of the apparatus 30, using, as a reference, the side 63h of the driving force receptor member 22.

Both of the longitudinal ends of the developing roller 12 are provided with spacer rollers 12a, 12b, respectively. Therefore, at the development position, the spacer rollers 12a, 12b are urged to the peripheral surface of the photo-

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sensitive drum **1** by the urging force of the urging means **25**, similarly to the foregoing, so that a predetermined gap is maintained between the developing roller **12** and the photosensitive drum **1**.

The developing blade **16** is of rubber, and is mounted to the frame **63** by mounting a plate **16a** to the frame with screws **16b**.

A locking member **71** is mounted to one side of the developing cartridge D (in FIG. 16, it is omitted). The locking member **71** is mounted on a cartridge frame portion **63h** at one longitudinal end portion of the developing roller **12** as the developing means. It comprises a locking engaging portion **71b** engageable with the shutter engaging portion **64b** provided in the shutter portion **64**, a supporting portion **71a** for supporting the locking engaging portion **71b**, and a mounting portion **71c** mounted to the cartridge frame portion **63h**. Designated by **63j** is a hole into which the mounting portion is inserted. The locking member **71** is an integrally-molded product of plastic resin material, and locks the shutter at the closing position by engagement between the locking engaging portion **71h** and the shutter engaging portion **64b**. In the process of mounting the developing cartridge D to the mounting position of the main assembly of the apparatus **30**, a part of the locking member **71** is contacted to a fixing portion provided in the main assembly of the apparatus **30**, by which the supporting portion **71a** is elastically deformed, so that locking engaging portion **71b** is disengaged from the shutter engaging portion **64b** to release the locking of the shutter **64**.

A projection **63d** as a semi-spherical engaging portion is provided only on one longitudinal end of the developing cartridge frame **63**, as shown in FIG. 18. Correspondingly, the shutter **64** is provided with an engaging portion in the form of a hole **64c** engageable with the projection **63d**. Therefore, when the shutter **64** is in the closing position, the projection **63d** is engaged in hole **64c**. So, even if the locking by the locking member **21** of the shutter **14** is released, the developing cartridge frame **13** is prevented from rotating to an unstable position relative to the shutter **14**.

One and the other ends of the cartridge frame **63** are provided with an orientation determination boss **63m** and a spring receptor portion **63k** in the form of projections.

As shown in FIG. 17, (a), designated by **73** is a grip for pulling a toner seal out, and it is used when it is to be removed.

The shutter **64** will be described.

Both side walls **64e**, **64f** of the shutter **64** are provided with round holes **640a**, which are engaged with the projected portion **63c**, **63g**, by which the shutter **64** is rotatably mounted to the frame **63**. As shown in FIG. 17, when the shutter **64** is closed, the opening **63b** is closed, and the developing roller **12** is covered by the shutter **64**. When the developing cartridge D is out of the main assembly of the apparatus **30**, the shutter **64** is closed, so that developing roller **12** is protected from deposition of foreign matter such as dust, and the roller **12** or the like is protected from damage. In addition, foreign matter does not enter the developing cartridge D. As shown in FIG. 17, when the shutter **64** is in the closing position by the locking portion **71**, the shutter **64** is locked at the closing position by the locking of the engaging portion **71b** and the engagement recess **64b**, so that it is prevented from unintentional opening.

When the developing cartridge D is mounted on the main assembly **30** of the image forming apparatus, the locking is automatically released to permit the opening of the shutter **64**.

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Referring to FIG. 19–FIG. 24, a description will be provided as to a process of mounting the developing cartridge D to the main assembly of the apparatus **30**, and a process of positioning the main assembly of the apparatus **30**.

As shown in FIG. 19, a guide **59** as a supporting member provided in one of the inner walls **11a** of the rotary unit **11**, comprises a guide inserting portion **59b** having an inclined portion **59a** inclined and open upwardly, a projected portion inserting portion **59d** having substantially parallel linear ribs **59c**, an engaging portion **59f** as a supporting member having an arcuate rib **59e**, and guide portion inserting portion **59h** having substantially parallel DC ribs **59g** continuing to the engaging portion **59f**.

When the developing cartridge D is inserted to the main assembly of the apparatus **30**, the user inserts the developing cartridge D while guiding the guide portion **70** and projected portion **63c** of the shutter **64** along the guide inserting portion **59a** (FIG. 20).

When the developing cartridge D is inserted, as shown in FIG. 21, the projected portion **63c** at one end of the developing cartridge D enters the linear portion of the projected portion inserting portion **59d**. The projected portion **63c** is provided with a cutting portion **63c1** which is provided by linearly cutting a cylinder at an angle parallel the linear rib **59c**. The two linear ribs **59c** which are engageable therewith have a width which permits only the parallel translational motion of the cutting portion **63c1** (direction **W1** in FIG. 19). Therefore, when the developing cartridge D is inserted while the cutting portion **63c1** is engaged with the linear rib **59c**, the developing cartridge D maintains a predetermined angle (orientation).

As shown in FIG. 22, when the projected portion **63c** is inserted to the arcuate rib **59e**, an end of one of the two inclined portions **59a**, is abutted to an arm portion **71a** locking the shutter **64** and raises it, as shown in FIG. 22. By this, the arm portion **71a** elastically deforms so that engaging portion **71b** is disengaged from the engagement recess **64b** to release the locking of shutter **64** (in this embodiment, the inclined portion **59a** also functions to release the locking member **21**). Thus, the shutter **64** becomes rotatable relative to the developing cartridge frame **63**. The arcuate rib **59e** has a radius for permitting rotation of the cylindrical projected portion **63c**, and the developing cartridge D is in a rotatable state about the cylindrical projected portion **63c**.

On the other hand, the projected portion **63g** at the other side **63i** of the developing cartridge D, is guided by the inclined portion **26c** of the guide **26** and enters the guide inserting portion **26d**. When the developing cartridge D is inserted further, the cutting portion **63g3** is engaged with the linear rib **26e**, and the developing cartridge D is inserted, maintaining the predetermined angle (orientation), similarly to the case of the projected portion **63c**. It is inserted until the projected portion **63g** reaches the arcuate rib (engaging portion) **26a**. The arcuate rib **26a** has a radius for permitting rotation of the projected portion **63g**. Therefore, the projected portion **63c** of one longitudinal end of the frame **63** is supported by the arcuate rib **59c** of the guide **59**, and the projected portion **63g** at the other end is supported by the arcuate rib **26a** of the guide **26**, and the developing cartridge D is supported on the rotary unit **11** for rotation about the both projected portions **63c** and **63g**.

The user pushes by hand the grip portion **63e** of the frame **63** in the state shown in FIG. 22. The shutter **64** is fixed since the guide portion **7** is sandwiched by the guide portion inserting portion **59h**, but the frame **63** is rotatable since the cylindrical projected portion **63c** is rotatable in the arcuate

rib 59e, Since the projected portion 63g is rotatable at the arcuate rib 26a, the semi-spherical projection 63d rotates beyond the hole 64c of the shutter 64 to a predetermined position (in the direction of an arrow X in FIG. 22). As described above in the foregoing, in this example, the shutter 64 is provided with an insertion guide portion 70, and therefore, the frame 63 is easily rotated while the shutter 64 is stationary. When it is rotated to the predetermined position, the frame 63 is positioned by positioning means which will be described hereinafter, and the developing cartridge D is mounted in place.

When the developing cartridge D is rotated in the direction indicated by the arrow X in the state shown in FIG. 22, the orientation determination bosses 63m provided on the ends 63h, of the developing device frame 63 lowers translatable slide members 10a provided on the opposite ends of the center shaft 10 of the rotary unit and urged by springs 10b. The slide portion 10a is slidable by engagement between the elongated hole 10a1 and the shaft 10c. When the frame 63 is further rotated, as shown in FIG. 24, the spring receptor portion 63k provided on the opposite lateral ends of the frame 63, are pressed by the spring 11a provided at the end portions of the rotary unit. By this, the frame 63 is urged in the direction of rotation in the direction of arrow Y (FIG. 24). However, since the orientation determination bosses 63m abut the center shaft 10 of the rotary unit 11, the orientation of the frame 63 is stabilized at the mounting position shown in FIG. 24.

Thus, the developing cartridge D is mounted at a predetermined position of the rotary unit 11.

Designated by 11j is a guide portion for guiding the boss 63m.

By this, the shutter 64 is opened relative to the frame 63 to permit the developing roller 12 to be exposed and face the photosensitive drum 1. During this mounting operation, the user can feel the rotation start position for the developing cartridge D on the basis of the click feeling provided by the removal of the semi-spherical projection 63d from the hole 64c of the shutter 64.

The diameter of the arcuate portion of the projected portion 63c is larger than the distance between the cutting portions 63c1, and therefore, the projected portion 63c is not disengaged from the linear rib 59c when the projected portion 63c is rotated at the position of the arcuate rib 59c.

On the other hand, when the developing cartridge D is taken out of the main assembly 30 of the image forming apparatus, the user rotates the frame 63 in the opposite direction, by which the cutting portion 63c1 is brought to be parallel with the linear rib 59c, and the shutter 64 is closed. The user can feel the rotation completion position of the developing cartridge D on the basis of the click feeling upon the engagement of the semi-spherical projection 63d into the hole 64c. When the developing cartridge D is taken out of the main assembly of the apparatus, the arm portion 71a of the locking member 71 is elastically restored, and the engaging portion 71b enters the engagement recess 64b, as shown in FIG. 21. By this, the shutter 64 is automatically locked.

Since the developing cartridge D is provided with a shutter 64, the developing roller 12 is protected from deposition of foreign matter such as dust, and since the shutter 64 is provided with the locking mechanism, the shutter 64 is prevented from being unintentionally opened.

When the developing device is inserted into the main assembly 30 of the image forming apparatus, the shutter 64 maintains its closed state, and therefore, the developing roller 12 is not damaged during insertion. Additionally, it is

not necessary for the user to remove a developing roller protection member or the like before insertion of the developing device.

Furthermore, the shutter locking is automatically released when the developing cartridge is mounted to the main assembly 30 of the image forming apparatus, and only by rotation thereof after the insertion, the shutter 64 is released, and the developing roller 12 faces the photosensitive drum 1, thus completing the mounting operation. Thus, the mounting operativity is improved.

A description will be provided as to positioning of the developing cartridge D.

Referring to FIG. 25, the arrangements of the spring receptor portion 63k (63k1, 63k2) and the orientation determination boss 63m, will be described.

One longitudinal end portion 63h of the developing roller 12 will be described, and the same applies to the other end portion 63i.

In this example, the spring receptor portion 63k is disposed within a range of approximately 100–130 degrees from a line 11 connecting a center of rotation M1 of the developing roller 12 and the center of rotation M2 of the driving force receptor portion 22 as seen in the longitudinal direction of the developing roller 12.

More particularly, in this example, the spring receptor portion 63k1 (63k2) is disposed at such a position that the angle formed between the line 11 connecting the center of rotation M1 of the developing roller 12 and the center of rotation M2 of the driving force receptor member 22, and the line 12 connecting the spring receptor surface 63k3 and the center of rotation M1, is approximately 100–130 degrees. In this example, the angle is approximately 115 degrees.

The boss 63m (63m1, 63m2) is disposed within a range of approximately 130–150 degrees from the line 11 across the line 11 from the spring receptor portion 63k.

More particularly, in this example, the angle formed between the line 11 and a line 13 connecting the center of the boss 63m and the center of rotation M1, is approximately 130–150 degrees. In this example, the angle is approximately 140 degrees.

By disposing the spring receptor portion 63k (63k1, 63k2) and the boss 63m (63m1, 63m2), the spring receptor portion 63k can properly receive the elastic force of the spring 11a provided in the main assembly of the apparatus 30. In addition, the boss 63m properly abuts the shaft 10. Therefore, the developing cartridge D is accurately positioned to the mounting position.

The boss 63m (63m1, 63m2) is projected outwardly from the side surface 63h, i of the frame 62 by approximately 2 mm–15 mm. In this example, the boss 63m is projected by approximately 4 mm.

The spring receptor portion 63k (63k1, 63k2) is projected outwardly from the side surface 63h, i by approximately 2 mm–20 mm. In this example, the spring receptor portion 63k1 is projected by approximately 10 mm, and 63k2 is projected by approximately 6 mm. Therefore, a projection length is larger in the spring receptor portion 63k1 provided at a driving force receiving side.

The features of the shutter of the developing cartridge D are summarized as follows.

The developing cartridge for developing a latent image formed on the photosensitive member, wherein the developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, and wherein the main assembly includes a main assembly guide for guiding the developing cartridge toward a mounting position in the main assembly, and includes a fixed portion,

the developing cartridge comprises: a cartridge frame of plastic resin material; a developing roller **12** for developing, with toner, the latent image formed on the photosensitive member **1** of the main assembly of the apparatus, when mounted to the main assembly of the electrophotographic image forming apparatus, wherein the developing roller carries on its peripheral surface an amount of toner regulated by a development blade **16**; a driving force receptor member **22** for receiving, from the main assembly of the device, a driving force for rotating the developing roller when the cartridge is mounted to the main assembly, the driving force receptor means being provided exposed adjacent one end of the cartridge frame portion **63h** in a longitudinal direction of the developing roller; a toner accommodating portion **63a** for accommodating the toner; a shutter **64** of plastic resin material which is movable between a closing position for covering a portion of the developing roller exposed from the cartridge frame portion **63** and an opening position for exposing the developing roller; a cartridge guide **70** for guiding the developing cartridge toward the mounting position by cooperation with the main assembly guide **26**, **59** when the developing cartridge is to be mounted to the mounting position, the cartridge guide being provided on the shutter portion **64e** which is movable along the cartridge frame portion **63h** provided adjacent the one end, wherein the cartridge guide has an elongated shape and is extended toward the driving force receptor member **22**; a locking member **71**, of plastic resin material, for releasably locking the shutter at the closing position, the locking member **71** including locking engaging portion **71b** engageable with a shutter engaging portion **64b** provided in the shutter portion, a supporting portion **71a** for supporting the locking engaging portion **71b**, and a mounting portion **71c** mounted on the cartridge frame portion, wherein the locking member is an integrally molded product of plastic resin material, and the shutter is locked at the closing position by engagement between the locking engaging portion and the shutter engaging portion, wherein in the process of mounting of the developing cartridge to a mounting position of the main assembly of the apparatus, a part of the locking member is contacted to a fixed portion **59a** of the main assembly of the apparatus, so that supporting portion **71a** is flexed to disengage the locking engaging portion from the shutter engaging portion, thus releasing locking of the shutter; wherein in the process of mounting of the developing cartridge to a mounting position of the main assembly of the apparatus, a part of the locking member is contacted to a fixed portion **59a** of the main assembly of the apparatus, so that supporting portion **71a** is flexed to disengage the locking engaging portion **71b** from the shutter engaging portion **64b**, thus releasing locking of the shutter **64**, and wherein the shutter is positioned at the opening position by a user rotating the cartridge frame to mount the developing cartridge at the mounting position while the guide is in engagement with a main assembly guide of the main assembly of the apparatus.

The supporting portion **64e** is rotatable about the same axis as that of the driving force receptor member **22**.

The cartridge guide **70** has an elongated shape, and is extended toward the driving force receptor means **22**.

The cartridge D further comprises an urged portion **63g** on the cartridge frame portion adjacent the one end, wherein the urged portion is urged by the elastic force of a spring member provided in the main assembly of the apparatus, wherein the developing cartridge is urged toward the one end by the elastic force of the spring member.

The features of the structure for the mounting of the developing cartridge D to the main assembly of the apparatus **30** are summarized as follows.

The developing cartridge D, for developing a latent image formed on the photosensitive member **1**, is detachably mountable to a main assembly **30** of an electrophotographic image forming apparatus. The developing cartridge comprises: a cartridge frame **63**; developing means (roller **12**) for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when mounted to the main assembly of the electrophotographic image forming apparatus; a first projected portion **63c** projected from a frame portion **63h** of the cartridge adjacent one longitudinal end of the developing means, wherein the first projected portion is supported by a first supporting member **59** provided in the main assembly, when the cartridge is mounted to the main assembly of the electrophotographic image forming apparatus; a second projected portion **63g** projected from the frame portion **63i** adjacent the other longitudinal end of the developing means, wherein the second projected portion is supported by a second supporting member **26** provided in the main assembly, when the cartridge is mounted to the main assembly of the electrophotographic image forming apparatus; a driving force receptor member **22** for receiving, from the main assembly of the device, a driving force for rotating the developing means, when the cartridge is mounted to the main assembly, wherein the driving force receptor member is exposed from the frame portion **63h** adjacent the one end; and a guide **70** for guiding the developing cartridge toward a mounting position when the cartridge is mounted to the main assembly.

The guide **70** is movable along an outside of the frame portion **63g** adjacent the one end.

The guide **70** has an elongated shape, and is rotatable about the driving force receptor member **22**. A longitudinal direction of the guide **70** is directed to the driving force receptor member **22**. The cartridge further comprises a rotatable member (shutter **64**) rotatably mounted on the frame portion **63**.

The guide is provided on the rotatable member, and more specifically, the guide **70** is provided on the rotatable member **64**.

The rotatable member **64** includes a shutter **64** for covering a portion of the developing means exposed from the cartridge frame **63**.

The shutter **64** is movable between a closing position for covering the exposed portion and an opening position for exposing the developing means.

The guide **70** is projected longitudinally outwardly and is provided on the shutter **64**.

The guide **74** is provided on a portion of the shutter **64** which is movable along an outside of the cartridge frame portion **63h** adjacent the one end.

The first projected portion **63c** includes two flat surface portions **63c1**, opposed to each other, for guiding the developing cartridge toward the mounting position in the main assembly when the cartridge is mounted to the main assembly, and two curved surface portions **63c2**, opposed to each other, for engaging with a recess **59f** of the first supporting member **59**.

The second projected portion **63g** includes two flat surface portions **63g3**, opposed to each other, for guiding the developing cartridge toward the mounting position in the main assembly when the cartridge is mounted to the main assembly, and two curved surface portions **63g4**, opposed to each other, for engaging with a recess **26a** of the second supporting member **26**. A distance L1 (FIG. 17, (a)) between outside surfaces of the flat surface portion **63c1** of the first projected portion **63c**, is larger than a distance L2 (FIG. 17,

(a)) between outside surfaces of the flat surface portion **63g3** of the second projected portion **63g**.

A distance **L1** between outer surfaces of the flat surface portions **63c1** of the first projected portion is approximately 13 mm–15 mm, and a distance **L2** between outer surfaces of the flat surface portions **63g3** of the second projected portion **63g** is approximately 2 mm–9 mm. In this embodiment, **L1** is approximately 15 mm, and **L2** is approximately 9 mm.

A distance **L3** (FIG. 17, (b)) between remotest outer surface portions of the curved surface portions **63c2** of the first projected portion **63c** is approximately 13 mm–17 mm, and a distance **L4** (FIG. 17, (a)) between remotest outer surface portions of the curved surface portions **63g4** of the second projected portion **63g** is approximately 7 mm–11 mm. In this embodiment, **L3** is approximately 17 mm, and **L4** is approximately 11 mm.

The driving force receptor member **22** is enclosed by the first projected portion **63c**. The driving force receptor member **22** is provided with a recess **22a** for engagement with a projection **24a** of the main assembly of the apparatus, wherein by engagement between the projection and the recess, a driving force is transmitted from the main assembly to the developing means.

The curved surface portion is of a continuous arcuate configuration.

When the developing cartridge D rotates from the mounting position (FIG. 24) to a development position (FIGS. 13 and 14) for developing a latent image formed on the photosensitive member, the developing cartridge rotates about the first projected portion **63c** and second projected portion **63g**.

The developing cartridge reaches the mounting position (FIG. 24) by approximately 90–120 degrees rotation from a mounting-and-demounting position (FIG. 22) about the first projected portion **63c** and the second projected portion **63g**. The mounting-and-demounting position (FIG. 22) is a position where the first projected portion **63c** and the second projected portion **63g** enters the first supporting member **59** and the second supporting member **26**, and where the flat surface portion **63g3** is opposing to engaging portions of the first supporting member and the second supporting member, respectively. In this embodiment, it is rotated through approximately 105 degrees.

The developing cartridge reaches a developing position by approximately 5–10 degrees rotation from the mounting position about the first projected portion **63c** and the second projected portion **63g**. The developing position is a position where spacer rollers **12a** of the developing member is urged to the electrophotographic photosensitive member **1**. In this embodiment, it is rotated through approximately 7 degrees.

The guide **70** functions to guide the developing cartridge D into the main assembly, and is displaceable relative to the first projection.

The guide **70** has an elongated shape, and rotates through approximately 90–120 degrees relative to the first projected portion **63c** to mount the developing cartridge at the mounting position in main assembly of the apparatus.

The cartridge further comprises a driving force receptor member **22** for receiving, from the main assembly of the device, a driving force for rotating the developing roller **12** when the developing cartridge is mounted to the main assembly of the device, wherein the driving force receptor member **22** is provided on the same longitudinal end as the first projected portion **63c**, and wherein the guide is provided only of the same side. Thus, the guide **70** is provided only on one side **63h**, and therefore, the developing cartridge D can be smoothly mounted.

The mounting position of the developing cartridge is a position where the developing cartridge is correctly positioned in place in the main assembly of the apparatus.

The development position of the developing cartridge is a position where the developing cartridge is positioned for effecting the development operation.

The mounting-and-demounting position of the developing cartridge is a position where the developing cartridge is mounted to or demounted from the supporting member provided in the main assembly of the apparatus. The supporting member is a member for supporting the developing cartridge when the developing cartridge is to be mounted to the mounting position.

The features for the positioning of the developing cartridge D relative to the main assembly of the apparatus are summarized as follows.

The developing cartridge D, for developing a latent image formed on the photosensitive member **1**, is detachably mountable to a main assembly **30** of an electrophotographic image forming apparatus. The developing cartridge comprises: a cartridge frame **63**; developing roller **12** for developing, with toner, the latent image formed on the photosensitive member **1** of the main assembly of the apparatus, when mounted to the main assembly of the electrophotographic image forming apparatus; a first projected portion **63c** outwardly projected from the cartridge frame portion **63h** adjacent one longitudinal end of the developing means, wherein the first projected portion is supported by a first supporting member **59** provided in the main assembly **30** of the apparatus when the cartridge is mounted to the main assembly; a second projected portion **63g** outwardly projected from the cartridge frame portion adjacent the other longitudinal end of the developing means, wherein the second projected portion is supported by a second supporting member **26** provided in the main assembly of the apparatus when the cartridge is mounted to the main assembly **30**; a first urging force receptor portion **63k1** outwardly projected from the cartridge frame portion **63h** adjacent one longitudinal end of the developing means, wherein the first urging force receptor portion receives an urging force by a first elastic member **11a** provided in the main assembly **30** when the cartridge is mounted to the main assembly, and wherein the first urging force receptor portion is integrally molded with the cartridge frame; a second urging force receptor portion **63k2** outwardly projected from the cartridge frame portion **63i** adjacent the other longitudinal end of the developing means, wherein the second urging force receptor portion receives an urging force by a second elastic member **11a** provided in the main assembly when the cartridge is mounted to the main assembly, and wherein the second urging force receptor portion is integrally molded with the cartridge frame; a first contact portion **63m1** outwardly projected from the cartridge frame portion **63h** adjacent one longitudinal end of the developing means, wherein the first contact portion contacts a first fixed portion **10** provided in the main assembly when the cartridge is mounted to the main assembly, wherein the first contact portion is integrally molded with the cartridge frame; a second contact portion **63m2** outwardly projected from the cartridge frame portion **63i** adjacent one longitudinal end of the developing means, wherein the second contact portion contacts a second fixed portion **10** provided in the main assembly when the cartridge is mounted to the main assembly, and wherein the second contact portion is integrally molded with the cartridge frame; a driving force receptor member **22** for receiving, from the main assembly **30**, a driving force for rotating the developing means when

the cartridge is mounted to the main assembly, wherein the driving force receptor member is exposed from the cartridge frame portion adjacent one longitudinal end of the developing roller; wherein as seen in a direction substantially perpendicular to the longitudinal direction of the developing means, the first urging force receptor portion and the second urging force receptor portion are within a range of approximately 100–130 degrees from a line connecting a center of rotation of the developing means and a center of rotation of the driving force reception member, and wherein the first contact portion and second contact portion are within a range of approximately 130–150 degrees.

The first receptor portion **63k** and the second one **63k** are flat in shape, and receive the urging forces from the first urging member **11a** and the second one **11a**.

The first contact portion **63m1** and second contact portion **63m2** are in the form of circular columns, and its peripheral surface portions are contacted to the first fixed portion **10** and second fixed portion **10**.

The structures of the cartridge frame, the developing roller, the driving force receptor member, the toner accommodating portion, the shutter, cartridge guide, the locking member, the fixing portion, the first projected portion, the second projected portion, the first and second urging force receptors, the portion, the second urging force receptor, the portion, the first contact portion, the second contact portion, the first fixed portion, and second fixed portion, are not limited to those described above, but may be modified.

A further embodiment will be described.

FIG. **26** is a side view of one end of the developing cartridge D.

In this example, another shape of the projected portion **63c** is used.

It is not inevitable to cut a cylindrical portion provided on an end surface of the frame **63** of the developing cartridge D to provide the projected portion **63c**. As shown in FIG. **25**, the linear portion **63c1** may be provided with at least one projection **63c3** so that width is smaller than the rib clearance **W1** (FIG. **19**) of the inlet of the guide **59**. The insertion is possible with the structure.

By this, the contact resistance with the rib of the guide **59** can be reduced to make the insertion of the developing cartridge D smoother.

Referring to FIG. **27**, a further embodiment will be described.

In FIG. **27**, cylindrical projection **63c** provided on a side **63h** of the frame **63** of the developing cartridge, has a configuration having a plurality of projections **63c4** contactable to the arcuation of such a diameter **D2** as is engageable with the diameter **D1** (FIG. **19**) of the arcuate rib of the guide **59**.

By this, the contact resistance with the rib of the guide **59** can be decreased to make smooth the rotation upon mounting of the developing cartridge D to the main assembly of the apparatus **30**.

FIG. **28** shows a further example wherein the structures of FIGS. **26** and **27** are used in combination, as will be understood from this figure.

Referring to FIG. **29**, another embodiment will be described.

In this embodiment, the shutter **80** is removed from the cartridge frame **63** by a user, or is mounted by the user. The guide **70** is provided in a rotatable member not in the shutter **80**. The rotatable member **81** is rotatable about a projection **63c** along a side **63h** of the cartridge frame. It is locked by the above-described locking member **71**. Therefore, the guide **70** has the same function as described in the foregoing

and the developing cartridge D can be mounted to the main assembly **30** in the same manner.

Prior to mounting the developing cartridge D to the main assembly **30**, the shutter **80** is removed from the frame **63** by the user. When the cartridge D is demounted from the main assembly **30**, the shutter is remounted to the frame by the user, as desired. The shutter is not inevitable, and may not be provided.

The guide **70** may not be provided on the rotatable member **81**, but may be mounted directly on the cartridge frame. In this case, the guide is rotatably mounted on the cartridge frame **63**.

According to the foregoing embodiments, the projections on longitudinal end surfaces of the developing cartridge frame are guided when the developing cartridge is mounted to the main assembly of the image forming apparatus, so that the developing cartridge can be inserted in a direction perpendicular to the longitudinal direction, and therefore, the insertion stroke can be reduced to improve the insertion operativity.

The driving connection between the developing cartridge and the main assembly is effected with the coupling configuration, so that a decrease of the driving accuracy due to the driving gear pitch nonuniformity, for example, can be prevented.

The foregoing cartridge frame, shutter or the like are made of plastic resin material such as polystyrene, ABS resin, polycarbonate, polyethylene, polypropylene, or the like.

The process cartridge is not limited to those described in the foregoing, but may contain as an unit at least one process means such as charging means, cleaning means or the like, and an electrophotographic photosensitive member, wherein the cartridge is detachably mountable relative to the main assembly of an electrophotographic image forming apparatus.

According to the present invention, the mounting operativity of the developing cartridge is improved.

Additionally, the developing cartridge can be mounted in the main assembly of the electrophotographic image forming apparatus with high positional accuracy.

Furthermore, since the urging force receptor portion and the contact portion are projected outwardly from the cartridge frame, the configuration of the cartridge frame can be selected with greater latitude.

While the invention has been described with reference to the structures disclosed herein, it is not confined to the details set forth and this application is intended to cover such modifications or changes as may come within the purposes of the improvements or the scope of the following claims.

What is claimed is:

1. A developing cartridge for developing a latent image formed on a photosensitive member, wherein said developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, said developing cartridge comprising:

a cartridge frame;

developing means for developing, with the toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing means, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;

- a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing means, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
 - a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
 - a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing means, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly;
 - a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly.
2. A cartridge according to claim 1, wherein as seen in the longitudinal direction of a developing roller of said developing means, said first urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly.
3. A cartridge according to claim 2, wherein as seen in the longitudinal direction of said developing roller, said first contact portion is disposed such that an angle formed between said first line and a third line connecting a center of said first contact portion and a center of rotation of said driving force reception member, is 130–150 degrees.
4. A cartridge according to claim 1, wherein said first urging force receptor portion and second urging force receptor portion are in the form of flat plates, and reception the urging force by said first elastic member and the urging force by said second elastic member.
5. A cartridge according to claim 4, wherein said first urging force receptor portion is integrally molded with a first frame member constituting said cartridge frame, and said second urging force receptor portion is integrally molded with a second frame member constituting said cartridge frame.
6. A cartridge according to claim 4 or 5, wherein said first urging force receptor portion and second urging force receptor portion are projected outwardly from said cartridge frame by 2 mm–20 mm.
7. A cartridge according to claim 1, wherein said first contact portion and second contact portion are in the form of

- circular columns, and its peripheral surface portions are contacted to said first fixed portion and second fixed portion.
8. A cartridge according to claim 7, wherein said first contact portion is integrally molded with said cartridge frame, and said second contact portion is integrally molded with said cartridge frame.
9. A cartridge according to claim 7 or 8, wherein said first contact portion and second contact portion are outwardly projected outwardly from said cartridge frame by 2 mm–15 mm.
10. A cartridge according to claim 1, wherein said first projected portion and said second projected portion have flat surface portions and curved surface portions, and said curved surface portions are rotatably engaged with said first supporting member and second supporting member, respectively.
11. A cartridge according to claim 1, wherein as seen in the longitudinal direction of a developing roller of said developing means, said second urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of second urging force receptor portion and the center of rotation of said driving force reception member, is with a range of 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly.
12. A cartridge according to claim 11, wherein as seen in the longitudinal direction of said developing roller, said second contact portion is disposed such that an angle formed between said first line and a third line connecting a center of the second contact portion and a center of rotation of said driving force reception member, is 130–150 degrees.
13. A developing cartridge for developing a latent image formed on a photosensitive member, wherein said developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, said developing cartridge comprising:
- a cartridge frame;
 - a developing roller for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
 - a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing roller, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
 - a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the

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other longitudinal end of said developing roller, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly;

- a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly;
- a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly; and
- a driving force receptor member for receiving, from the main assembly, a driving force for rotating said developing roller when said cartridge is mounted to the main assembly, wherein said driving force receptor member is exposed from said cartridge frame portion adjacent one longitudinal end of said developing roller,

wherein as seen in the longitudinal direction of said developing roller, said first urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly, said second urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a line connecting a portion of said second urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly.

14. A cartridge according to claim **13**, wherein said first urging force receptor portion and second urging force receptor portion are in the form of flat plates, and reception the urging force by said first elastic member and the urging force by said second elastic member.

15. A cartridge according to claim **14**, wherein said first urging force receptor portion is integrally molded with a first frame member constituting said cartridge frame, and said second urging force receptor portion is integrally molded with a second frame member constituting said cartridge frame.

16. A cartridge according to claim **14** or **15**, wherein said first urging force receptor portion and second urging force receptor portion are projected outwardly from said cartridge frame by 2 mm–20 mm.

17. A cartridge according to claim **13**, wherein said first contact portion and second contact portion are in the form of circular columns, and their peripheral surface are contacted to said first fixed portion and second fixed portion.

18. A cartridge according to claim **17**, wherein said first contact portion is integrally molded with a first frame member constituting said cartridge frame, and said second

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contact portion is integrally molded with a second frame member constituting said cartridge frame.

19. A cartridge according to claim **17** or **18**, wherein said first contact portion and second contact portion are outwardly projected outwardly from said cartridge frame by 2 mm–15 mm.

20. A cartridge according to claim **13**, wherein said first projected portion and said second projected portion have flat surface portions and curved surface portions, and said curved surface portions are rotatably engaged with said first supporting member and second supporting member, respectively.

21. A cartridge according to claim **13** wherein as seen in the longitudinal direction of said developing roller, said first contact portion is disposed such that an angle formed between said first line and a third line connecting a center of the first contact portion and a center of rotation of said driving force reception member, is 130–150 degrees.

22. A cartridge according to claim **21** wherein as seen in the longitudinal direction of said developing roller, said second contact portion is disposed such that an angle formed between said first line and a third line connecting a center of the second contact portion and a center of rotation of said driving force reception member, is 130–150 degrees.

23. A developing cartridge for developing a latent image formed on a photosensitive member, wherein said developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, said developing cartridge comprising:

- a cartridge frame;
- a developing roller for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
- a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing roller, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
- a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
- a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing roller, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly, and wherein said first urging force receptor portion is integrally molded with a first frame member constituting said cartridge frame;
- a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly, and wherein said second urging force receptor portion is integrally molded with a second frame member constituting said cartridge frame;

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a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly, wherein said first contact portion is integrally molded with the first frame member constituting said cartridge frame;

a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly, and when said second contact portion is integrally molded with the second frame member constituting said cartridge frame;

a driving force receptor member for receiving, from the main assembly, a driving force for rotating said developing roller when said cartridge is mounted to the main assembly, wherein said driving force receptor member is exposed from said cartridge frame portion adjacent one longitudinal end of said developing roller,

wherein as seen in a longitudinal direction of said developing roller, each of said first and second urging force receptor portions is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first or second urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly, and wherein as seen in the longitudinal direction of said developing roller each of said first and second contact portions is disposed such that an angle formed between said first line and a third line connecting a center of said first or second contact portion and a center of rotation of said driving force reception member, is 130–150 degrees.

24. A cartridge according to claim **23**, wherein said first urging force receptor portion and second urging force receptor portion are in the form of flat plates, and reception the urging force by said first elastic member and the urging force by said second elastic member.

25. A cartridge according to claim **23** or **24** wherein said first urging force receptor portion and second urging force receptor portion are projected outwardly from said cartridge frame by 2 mm–20 mm.

26. A cartridge according to claim **23** wherein said first contact portion and second contact portion are in the form of circular columns, and its peripheral surface portions are contacted to said first fixed portion and second fixed portion.

27. A cartridge according to claims **23** or **26**, wherein said first contact portion and second contact portion are outwardly projected outwardly from said cartridge frame by 2 mm–15 mm.

28. A cartridge according to claim **23**, wherein said first projected portion and said second projected portion have flat surface portions and curved surface portions, and said curved surface portions are rotatably engaged with said first supporting member and second supporting member, respectively.

29. An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

- a. an electrophotographic photosensitive member;

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- b. a first supporting member;
- c. a second supporting member;
- d. a first elastic member;
- e. a second elastic member;
- f. a first fixed portion;
- g. a second fixed portion;
- h. a mounting member for detachably mounting a developing cartridge; said developing cartridge comprising: developing means for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
- a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing means, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
- a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
- a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing means, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
- a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
- a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing means, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly;
- a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing means, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly; and
- i. a driving force transmission member for transmitting a driving force to said developing cartridge mounted to said mounting member.

30. An apparatus according to claim **29** wherein a black developing cartridge for developing a latent image with black color toner, a yellow developing cartridge for developing a latent image with yellow color toner, magenta developing cartridge for developing a latent image with magenta color toner, and a cyan developing cartridge for developing a latent image with cyan color toner, are mountable to said mounting member.

31. An apparatus according to claim **29** wherein said electrophotographic photosensitive member is contained in

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a process cartridge detachably mountable to a main assembly of said image forming apparatus, said process cartridge further containing a charging member for charging said electrophotographic photosensitive member and cleaning member for removing residual toner from said electrophotographic photosensitive member. 5

32. An apparatus according to claim **29** wherein a driving force receptor means provided in said developing cartridge, is provided with a recess, which is engageable with a projection of said driving force transmission member to receive driving force from a motor. 10

33. An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

- a. an electrophotographic photosensitive member;
- b. a first supporting member;
- c. a second supporting member;
- d. a first elastic member;
- e. a second elastic member;
- f. a first fixed portion;
- g. a second fixed portion;
- h. a mounting member for detachably mounting a developing cartridge, said developing cartridge comprising:
 - a developing roller for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
 - a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing roller, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
 - a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly;
 - a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly;
 - a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly;

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a driving force receptor member for receiving, from the main assembly, a driving force for rotating said developing roller when said cartridge is mounted to the main assembly, wherein said driving force receptor member is exposed from said cartridge frame portion adjacent one longitudinal end of said developing roller;

wherein as seen in the longitudinal direction of said developing roller, said first urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly, said second urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a line connecting a portion of said second urging force reception member and the center of rotation of said driving force reception member is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly; and

- i. a driving force transmission member for transmitting a driving force to said driving force receptor member of said developing cartridge when said cartridge is mounted to said mounting member.

34. An apparatus according to claim **33**, wherein a black developing cartridge for developing a latent image with black color toner, a yellow developing cartridge for developing a latent image with yellow color toner, magenta developing cartridge for developing a latent image with magenta color toner, and a cyan developing cartridge for developing a latent image with cyan color toner, are mountable to said mounting member.

35. An apparatus according to claim **33** wherein said electrophotographic photosensitive member is contained in a process cartridge detachably mountable to a main assembly of said image forming apparatus, said process cartridge further containing a charging member for charging said electrophotographic photosensitive member and cleaning member for removing residual toner from said electrophotographic photosensitive member.

36. An apparatus according to claim **33** wherein said driving force transmission member has a projection, which is engageable with a recess of said driving force receptor member to transmit driving force.

37. An electrophotographic image forming apparatus for forming an image on a recording material, comprising:

- a. an electrophotographic photosensitive member;
- b. a first supporting member;
- c. a second supporting member;
- d. a first elastic member;
- e. a second elastic member;
- f. a first fixed portion;
- g. a second fixed portion;
- h. a mounting member for detachably mounting a developing cartridge, said developing cartridge comprising:
 - a developing roller for developing, with toner, the latent image formed on the photosensitive member of the

main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing roller, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;

a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;

a first urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first urging force receptor portion receives an urging force by a first elastic member provided in the main assembly when said cartridge is mounted to the main assembly, and wherein said first urging force receptor portion is integrally molded with a first frame member constituting said cartridge frame;

a second urging force receptor portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second urging force receptor portion receives an urging force by a second elastic member provided in the main assembly when said cartridge is mounted to the main assembly, and wherein said second urging force receptor portion is integrally molded with a second frame member constituting said cartridge frame;

a first contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing roller, wherein said first contact portion contacts a first fixed portion provided in the main assembly when said cartridge is mounted to the main assembly, wherein said first contact portion is integrally molded with the first frame member constituting said cartridge frame;

a second contact portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing roller, wherein said second contact portion contacts a second fixed portion provided in the main assembly when said cartridge is mounted to the main assembly, and wherein said second contact portion is integrally molded with the second frame member constituting said cartridge frame;

a driving force receptor member for receiving, from the main assembly, a driving force for rotating said developing roller when said cartridge is mounted to the main assembly, wherein said driving force receptor member is exposed from said cartridge frame portion adjacent one longitudinal end of said developing roller;

wherein as seen in the longitudinal direction of said developing roller, each of said first and second urging force receptor portions is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first or second

urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly, and wherein as seen in the longitudinal direction of said developing roller each of said first and second contact portions is disposed such that an angle formed between said first line and a third line connecting a center of said first or second contact portion and a center of rotation of said driving force reception member, is 130–150 degrees; and

j. a driving force transmission member for transmitting a driving force to said driving force receptor member of the developing cartridge when said cartridge is mounted to said mounting member.

38. An apparatus according to claim **37** wherein a black developing cartridge for developing a latent image with black color toner, a yellow developing cartridge for developing a latent image with yellow color toner, magenta developing cartridge for developing a latent image with magenta color toner, and a cyan developing cartridge for developing a latent image with cyan color toner, are mountable to said mounting member.

39. An apparatus according to claim **37** wherein said electrophotographic photosensitive member is contained in a process cartridge detachably mountable to a main assembly of said image forming apparatus, said process cartridge further containing a charging member for charging said electrophotographic photosensitive member and cleaning member for removing residual toner from said electrophotographic photosensitive member.

40. An apparatus according to claim **37** wherein said driving force transmitting member has a projection, which is engageable with a recess of said driving force receptor member to transmit the driving force.

41. A developing cartridge for developing a latent image formed on a photosensitive member, wherein said developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, said developing cartridge comprising:

a cartridge frame;

a developing member for developing, with the toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing member, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;

a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing member, wherein said first projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;

an urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing member, wherein said urging force receptor portion receives an urging force by an elastic member provided in the main assembly when said cartridge is mounted to the main assembly; and

a contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing member, wherein said contact portion contacts a fixed portion provided in the main assembly when said cartridge is mounted to the main assembly. 5

42. A cartridge according to claim 41, wherein as seen in the longitudinal direction of a developing roller of said developing means, said urging force receptor portion is disposed such that an angle formed between a first line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first urging force receptor portion for receiving the elastic force and the center of rotation of said driving force reception member, is 100–130 degrees, and said a driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly. 10 15

43. A cartridge according to claim 42, wherein as seen in the longitudinal direction of said developing roller, said first contact portion is disposed such that an angle formed between said first line and a third line connecting a center of the first contact portion and a center of rotation of said driving force reception member, is 130–150 degrees. 20

44. A cartridge according to claim 41, wherein said urging force receptor portion is in the form of flat plates, and receive the urging force by said elastic member. 25

45. A cartridge according to claim 44, wherein said urging force receptor portion is integrally molded with a frame member constituting said cartridge frame. 30

46. A cartridge according to claim 44 or 45, wherein said urging force receptor portion is projected outwardly from said cartridge frame by 2 mm–20 mm. 35

47. A cartridge according to claim 41, wherein said contact portion is in the form of circular column, and its peripheral surface portion contacts said fixed portion. 40

48. A cartridge according to claim 47, wherein said first contact portion is integrally molded with said cartridge frame, and said second contact portion is integrally molded with said cartridge frame. 45

49. A cartridge according to claim 47 or 48, wherein said contact portion is outwardly projected from said cartridge frame by 2mm–15mm. 50

50. A cartridge according to claim 41, wherein said first projected portion and said second projected portion have flat surface portions and curved surface portions, and said curved surface portions are rotatably engaged with said first supporting member and second supporting member, respectively. 55

51. A developing cartridge for developing a latent image formed on a photosensitive member, wherein said developing cartridge is detachably mountable to a main assembly of an electrophotographic image forming apparatus, said developing cartridge comprising: 60

a cartridge frame;

developing member for developing, with the toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said developing cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;

a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing member, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said developing cartridge is mounted to the main assembly; 65

a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing member, wherein said second projected portion is supported by a second supporting member provided in the main assembly of the apparatus when said developing cartridge is mounted to the main assembly;

an urging force receptor portion outwardly projected from said cartridge frame portion in a longitudinal direction of said cartridge frame, wherein said urging force receptor portion receives an urging force by an elastic member provided in the main assembly when said developing cartridge is mounted to the main assembly; and

a contact portion outwardly projected from said cartridge frame portion in a longitudinal direction of said cartridge frame, wherein said contact portion contacts a fixed portion provided in the main assembly when said developing cartridge is mounted to the main assembly.

52. A cartridge according to claim 51, wherein as seen in the longitudinal direction of a developing roller of said developing means, said urging force receptor portion is disposed such that an angle formed between the line connecting a center of rotation of said developing roller and a center of rotation of a driving force reception member and a second line connecting a portion of said first urging force receptor portion and the center of rotation of said driving force reception member, is 100–130 degrees, and said driving force reception member receives a driving force for rotating said developing roller when said developing cartridge is mounted to the main assembly. 25 30

53. A cartridge according to claim 52, wherein as seen in the longitudinal direction of said developing roller said first contact portion is disposed such that an angle formed between said first line and a third line connecting a center of said first contact portion and a center of rotation of said driving force reception member, is 130–150 degrees. 35

54. A cartridge according to claim 51, wherein said urging force receptor portion is in the form of flat plates, and receive the urging force by said elastic member. 40

55. A cartridge according to claim 54, wherein said urging force receptor portion is integrally molded with a frame member constituting said cartridge frame. 45

56. A cartridge according to claim 54 or 55, wherein said urging force receptor portion is projected outwardly from said cartridge frame by 2 mm–20 mm. 50

57. A cartridge according to claim 51, wherein said contact portion is in the form of a circular column, and its peripheral surface portion contacts said fixed portion. 55

58. A cartridge according to claim 57, wherein said first contact portion is integrally molded with said cartridge frame, and said second contact portion is integrally molded with said cartridge frame. 60

59. A cartridge according to claim 57 or 58, wherein said contact portion is outwardly projected from said cartridge frame by 2 mm–15 mm. 65

60. A cartridge according to claim 51, wherein said first projected portion and said second projected portion have flat surface portions and curved surface portions, and said curved surface portions are rotatably engaged with said first supporting member and second supporting member, respectively.

61. An electrographic image forming apparatus for forming an image on a recording material, comprising:

- a. an electrophotographic photosensitive member;
- b. a first supporting member;
- c. a second supporting member;

- d. an elastic member;
 - e. a fixed portion;
 - f. a mounting member for detachably mounting a developing cartridge, said developing cartridge comprising:
 - a developing member for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
 - a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing member, wherein said first projected portion is supported by a first supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing member, wherein said second projected portion is supported by the second supporting member provided in the main assembly of the apparatus when said cartridge is mounted to the main assembly;
 - an urging force receptor portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing member, wherein said urging force receptor portion receives an urging force by the elastic member provided in the main assembly when said cartridge is mounted to the main assembly; and
 - a contact portion outwardly projected from said cartridge frame portion adjacent said one longitudinal end of said developing member, wherein said contact portion contacts the fixed portion provided in the main assembly when said cartridge is mounted to the main assembly; and
 - g. a driving force transmission member for transmitting a driving force to said developing cartridge mounted to said mounting member.
62. An electrographic image forming apparatus for forming an image on a recording material, comprising:
- a. an electrophotographic photosensitive member;
 - b. a first supporting member;

- c. a second supporting member;
- d. an elastic member;
- e. a fixed portion;
- f. a mounting member for detachably mounting a developing cartridge, said developing cartridge comprising:
 - a developing member for developing, with toner, the latent image formed on the photosensitive member of the main assembly of the apparatus, when said developing cartridge is mounted to the main assembly of the electrophotographic image forming apparatus;
 - a first projected portion outwardly projected from said cartridge frame portion adjacent one longitudinal end of said developing member, wherein said first projected portion is supported by the first supporting member provided in the main assembly of the apparatus when said developing cartridge is mounted to the main assembly;
 - a second projected portion outwardly projected from said cartridge frame portion adjacent the other longitudinal end of said developing member, wherein said second projected portion is supported by the second supporting member provided in the main assembly of the apparatus when said developing cartridge is mounted to the main assembly;
 - an urging force receptor portion outwardly projected from said cartridge frame in a longitudinal direction of said cartridge frame, wherein said urging force receptor portion receives an urging force by the elastic member provided in the main assembly when said developing cartridge is mounted to the main assembly; and
 - a contact portion outwardly projected from said cartridge frame portion in a longitudinal direction of said cartridge frame, wherein said contact portion contacts the fixed portion provided in the main assembly when said developing cartridge is mounted to the main assembly; and
- g. a driving force transmission member for transmitting a driving force to said developing cartridge mounted to said mounting member.

* * * * *

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,072,969
DATED : June 6, 2000
INVENTOR(S) : Kanji Yokomori, et al

Page 1 of 4

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 3:

Line 62, "FIG." should be deleted.
Line 65, "FIG." should be deleted.
Line 66, "and 12, illustrate" should read --and 12 illustrate--.

Column 7:

Line 12, "the-toner" should read --the toner--.
Line 38, "able" should read --ably--.
Line 62, "The" should read --the--.

Column 8:

Line 45, "14, This" should read --14. This--.

Column 9:

Line 1, "to" should read --into--.

Column 10:

Line 14, "operativity" should read --operativeness--.
Line 18, "as shown in" should be deleted.
Line 66, "off-set" should read --offset--.

Column 11:

Line 29, "it" should read --it is --.
Line 63, "FIG." should be deleted.

Column 12:

Line 5, "to" should read --into--.
Line 9, "to" should read --into--.
Line 29, "(b),FIG. 16" should read --(b). FIG. 16--.

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,072,969
DATED : June 6, 2000
INVENTOR(S) : Kanji Yokomori, et al.

Page 2 of 4

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 13:

Line 5, "is" should read --is made--.

Line 48, "holes 640a," should read --holes 64a,--.

Column 14:

Line 34, "to" should read --into--.

Column 15:

Line 1, "rib 59e," should read --rib 59e.--.

Column 16:

Line 21, "M1" should read --M2--.

Line 22, "M2" should read --M1--.

Line 28, "M1" should read --M2--.

Line 29, "M2" should read --M1--.

Column 19:

Line 48, "is" should read --are--.

Line 65, "of" should read --on--.

Column 22:

Line 29, "an" should read --a--.

Column 23:

Line 27, "assembly;" should read --assembly--.

Line 54, "reception" should read --receive--.

Column 24:

Line 1, "its" should read --their--.

Line 25, "with" should read --within--.

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,072,969
DATED : June 6, 2000
INVENTOR(S) : Kanji Yokomori, et al.

Page 3 of 4

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 25:

Line 48, "reception" should read --receive--.

Column 26:

Line 13, "claim 13" should read --claim 13,--.

Line 19, "claim 21" should read --claim 21,--.

Line 50, "one" should read --said one--.

Column 27:

Line 16, "frame;" should read --frame; and--.

Line 44, "reception" should read --receive--.

Line 47, "or 24" should read --or 24,--.

Line 51, "claim 23" should read --claim 23, --.

Line 53, "its" should read --their--.

Column 28:

Line 47, "assembly" should read --assembly; and --.

Line 57, "claim 29" should read --claim 29,--.

Line 60, "magenta" should read --a magenta--.

Column 29:

Line 12, "electrographic" should read --electrophotographic--.

Line 67, "assembly;" should read --assembly; and--.

Column 30:

Line 7, "roller;" should read --roller,--.

Line 37, "magenta" should read --a magenta--.

Line 42, "claim 33" should read --claim 33,--.

Line 50, "claim 33" should read --claim 33,--.

Column 31:

Line 53, "frame;" should read --frame; and--.

Line 60, "roller;" should read --roller,--.

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 6,072,969
DATED : June 6, 2000
INVENTOR(S) : Kanji Yokomori, et al.

Page 4 of 4

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

Column 32:

Line 17, "claim 37" should read --claim 37,--.
Line 20, "magenta" should read --a magenta--.
Line 25, "claim 37" should read --claim 37,--.
Line 33, "claim 37" should read --claim 37,--.

Column 33:

Line 15, "a" should be deleted.
Line 27, "receive" should read --receives--.
Line 33, "2m." should read --2mm--.
Line 35, "of" should read --of a--.
Line 40, "receive" should read --recieves--.

Column 34:

Line 63, "electrographic" should read --electrophotographic--.

Column 35:

Line 40, "electrographic" should read --electrophotographic--.

Signed and Sealed this

Nineteenth Day of June, 2001

Nicholas P. Godici

Attest:

Attesting Officer

NICHOLAS P. GODICI

Acting Director of the United States Patent and Trademark Office